JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES—GAS, &c.

Value of Experimental Works.

ENVIOUS eyes must be turned on the broad opportunity for investigation afforded by the experimental gas-works and laboratory of the German Association at Carlsruhe (which are under the direction of Dr. Karl Bunte). Until a centre of the kind is started, and sets out to fulfil its purpose, one cannot properly gauge the extent or character of the work that can be undertaken there. Carlsruhe is now the home of constantly developing activity. One piece of work suggests others; and initial investigation in a fresh branch leads to further expansion. The indication of the contents of the reports on the work, as published in our columns last week, forces this upon one's notice.

The examination of typical coals used in German gas-works is being continued at Carlsruhe. When the results are published (they include those of British as well as of German coals), the work should be a valuable one as an authoritative statement regarding producing qualities at this particular period, inasmuch as there is no very reliable record in existence to-day as to the merits of large varieties of coal raised from pits long since established and continually worked. Useful suggestions are found in the directions printed last week for sampling coal, coke, tar, and purifying material for examination. To get really reliable comparative results, consistency in sampling is of primary importance. Researches are going to be conducted into the applications of gas; and the road has been prepared for these by a number of fundamental and preliminary investigations, so that the actual work when inaugurated may proceed without interruptions from inefficient appliance and miscalculated method. There is scarcely any, if any, material (as a class, though not of all qualities), used or produced on gas-works that has not already been examined; and that the work is well up to date is attested by the fact that the recent discovery that tar and tar oils, of the vertical retort and carburetted water-gas variety, can be used in internal combustion engines has been promptly taken up for investigation. Domestic gas appliances are also periodically examined to see that they are being kept up to high-water-mark in conforming with practical requirements; and now a set of rules is being compiled for the gas-cooker manufacturers, for guidance in testing their productions. This adumbrates merely one side of the work at the Carlsruhe experimental station; the value of all this activity in training men to serve the gas industry is another side.

Of course, the existence of such a centre has its advantages and its disadvantages. But the former must outweigh the latter. Much work is carried out, and systematically, that was never undertaken before when left solely to private enterprise and opportunity. Much work is prosecuted that could not be conducted except at a place equipped and staffed as are these works and laboratory at Carlsruhe. Here, however, tests of materials are carried out for gas undertakings for stated fees; and that is where the works and laboratory trespass on the province of the professional gas chemist. Other than for those works that have their own laboratories and chemical staff, Carlsruhe bids fair to obtain a monopoly of the work that some of the men who are turned out there may be looking forward to in the future as the source of employment and income. This is one objection we see, and the objection is intensified by the view we hold, that in an industry of the character of gas manufacture and supply, it is not a good thing to restrict too tightly in any direction the number of cultured brains attracted to, and profitably employed by, it. It would be a pity for this work to become a matter of competition in respect of fees as between the private practitioner and Carlsruhe. On the other hand, there is the question of the superiority of facility and equipment at the latter centre for the prosecution of examinations of materials of all kinds. Nevertheless we cannot but feel an amount of sympathy for those who hold that the work so carried on to an extent trespasses on their domain, and to their personal detriment. It is, however, a question as to the balance of advantage to the gas industry as a whole; but the difficulty to which we have here called attention is not altogether a pleasant one.

Municipal Gas Finance and Parliament.

THE unpretentious and uninformative heading—"Milford "Haven Gas Order"—to a short report of proceedings before the Committee on Unopposed Bills that appeared in our "Parliamentary" columns last week may have been sufficient to cause many of our readers, and among them readers interested in municipal gas undertakings, to pass unnoticed what looks like a further revision on the part of the parliamentary authorities of their procedure in connection with the finances of municipal gas undertakings. If this is to be a new rule, we hope that the parliamentary authorities will ensure, in order to effect consistency of procedure, that it applies to all (not only gas) municipal trading concerns. We need scarcely remind readers how, in the Potteries Federation Scheme, in the last Glasgow Corporation Act, in the last Act of the Oldham Corporation referring to the gas and water undertakings, and in one or two measures that have been obtained under the Scottish Legislation Act, as well as in a Salford Corporation Bill (which was withdrawn), Parliament insisted either upon a complete abolition of the system of profit appropriation in aid of the rates, or a curtailment to a reasonable and definite percentage in place of the old *ad libitum* transference that formerly obtained. Now the Chairman of Ways and Means (Mr. Alfred Emmott) tells us that there is yet another manner in which it is intended in future to compel municipal gas undertakings to periodically come up for review by Parliament.

Personally, we do not believe in any undue statutory harnessing of commercial enterprise; but we do believe in the statutory control of all undertakings being on lines of equality. It cannot be said that the control of Parliament over municipal gas undertakings is on an equality with that over company-directed concerns. A company is, as a rule, bound, under present conditions of capital powers and business development, to come to Parliament at least once in ten or twelve years for fresh financial authorization; and the tendency of this must be to keep companies—again, we are speaking generally—under the modern developments or modifications of legislation. But the capital powers conferred on municipal gas undertakings, and the comparatively easy process by which they have hitherto been allowed to extend their borrowings, is partially the reason for the very long intervals between their appearances in Parliament. The Committee have—apparently only just now—discovered this partial reason; but, without general legislation, any step taken to effect a remedy can only be efficacious in the case of those local bodies who happen, from sheer necessity, to be compelled to come to Parliament. There are several municipal gas undertakings whose powers have sufficed to keep them away from Parliament for —— we were about to write, "ages," by charging all the extensions (as well as the replacements) to revenue. When we have regard to the price of gas that to-day exists in the districts of some of those concerns, we do not know that any substantial objection can be laid against the past policy of the management of the particular concerns in mind, though, in the case of others, it has paved the way to pandering to the socialistic (and not perhaps all socialistic) clamour for more profits to feed the municipal treasury from other sources than the legitimate rates. If profit appropriation is stopped, it would at once end any great objection to the utilization of surpluses in strengthening the position of a concern by curtailing additions to capital, as the effect would be the

improvement of the efficiency of service and supply, at the lowest possible price.

However, this ability to keep from Parliament, has representation in a good deal of antiquated legislation applying to municipal gas undertakings. And yet without some special means of compelling municipal authorities owning such concerns to come to Parliament to have their position and controlling enactments reviewed, they have the power to keep themselves aloof from the only authority that can exercise any thorough supervision over them. The definite fixing of capital powers can only result in periodically bringing to Parliament those concerns upon which such condition is fixed, and which find it necessary to ask for an enlargement of powers. Hitherto, when a municipal gas concern has applied for capital powers, a sum has generally been named, with the provision attached that further sums may be borrowed with the sanction of the Local Government Board. This, in effect, gives the municipal gas undertaking unlimited borrowing powers; and, in consequence of this, there may be no necessity for such a concern to approach Parliament again till (say) new powers for manufacturing purposes are required.

Here we have the weakness that the proceedings on this little Milford Haven Gas Order have disclosed to the parliamentary authorities, and which they have, it seems, determined to end by fixing capital powers in the case of municipal authorities, and not give them unlimited authorization. The Local Government Board plead for such concerns that the local inquiry enables the Board to keep the undertakings under supervision. The local inquiry, by no twist of the imagination, can be said to be the equivalent of the proceedings before a Parliamentary Committee, nor to compass the powers of the latter. The Board have not the authority to review and, if necessary, amend statutory powers. All they can do is to see that loans are properly expended, sanction, or decline to sanction, new loans, and occasionally administer rebuke if they find over-spendings or any other capital malpractice. There is a vast difference between this and what a Parliamentary Committee can do. The Committee over whom the Chairman of Ways and Means so ably presides recognize this. The Committee were inexorable on this occasion to the pleadings of the Board. The representatives of the Board entreated them to let this Order go through, and then for the parliamentary authorities to deal with the whole question next session. The Committee refused, and straightway fixed the capital at £12,000—based upon an expenditure at the rate of £4000 to £5000 per five years. The Chairman observed—and in the double-barrelled remark lies the essence of the matter—that "the Committee do not desire to do anything which "will compel a local authority to come to Parliament every "three or four years; neither do they wish to encourage a "system which enables a local authority to keep away from "Parliament for a long period." The spirit of this remark is carried out in the decision of the Committee.

The Principles and the Specification.

In our columns this week, a student of the subject of street illumination essays to extract from the recent publication by the "Illuminating Engineer" of replies to questions distributed among recognized followers of the science of illumination some conclusions to afford a little light and leading in considering the question of a street-lighting specification. But he has not been very successful, though the examination he makes is useful, in that it helps to sift the practically valueless considerations from those that may be valuable, and which latter are the ones to be pursued in any attempt to arrive at a tentative or definite goal. The contribution also accentuates what the replies under examination indicated, that opinion and judgment are so scattered on the variable problems that constitute the subject, that on not a single one of the knotty points have opinion and judgment been reduced to two sides—comprising either a plain affirmative or a plain negative. It also emphasizes the necessity for great care being exercised in examining every point thoroughly before giving it endorsement, and a place in the constitution of the specification. If the "Illuminating "Engineer" has done one good piece of service above others in ascertaining the views of experts, it has been in showing that this matter of a specification for street lighting is not one that can be forced hastily into any embodiment without considerable and patient investigation in regard to every point involved.

Indeed, it is very doubtful whether all the members forming the Committee now considering the question of a standard specification for street lighting could give a sound reason for voting on every one of the essential problems. This is just where danger in the present arises. With the premises rough and chaotic, there can be no certainty about the deductions. It is on this point that one may pause. There is no violent hurry for the specification. The world has got along very well without one so far; and the world will not go into ecstasies when it does get one. Therefore let the foundations be well prepared before the constructive work is proceeded with. Otherwise, the specification itself may be a poor thing; and otherwise, too (till there is a fair amount of external agreement and understanding of the fundamentals), there will be the greater difficulty in getting people to adopt the specification, however good it may be. The ground work is not at the present stage sufficiently far advanced; and this is the more manifest, the farther the problems are probed, and the light of fresh minds is brought to bear upon them. Besides which the sceptics as to the value of a street-lighting specification are wanting to know how any single specification can be fitted to conditions that are altogether incongruous and incomparable. The only advice we can tender to the latter is to "wait and see;" for we at all events cannot answer the question. It is a matter that must have consideration when we have exposed to view the character of the fruit of the work of the present Committee.

Energy—Gas Oil Tar and Tar as Engine Fuel.

The British Association for the Advancement of Science will be meeting at Portsmouth in a few weeks from now; and the programme that has been published shows that there will be a plethora of matter to occupy those who will be attending. But unless the Committees on Gaseous Explosions and Internal Combustion Engines produce something, the proceedings, it seems clear, will not otherwise have a large yield of a nature especially attractive to our readers. "The Times" has published a forecast of the proceedings; and it is stated that the President (Sir William Ramsay) will sound as his leading note the increasing need of scientific training with a view to future, as well as to present-day, requirements. It passes strange that there should be any call for such a note to-day. But so it is; and Sir William's voice we hope will do something to stir up greater thought, and press home the need in quarters from which scoffs are at present heard, which scoffs reveal deplorable shallowness of conception and contracted view. It is also predicted that the President will consider the subject of the available sources of energy in this country, and whether a reasonably economical use is being made of them. Having come to the conclusion that the present-day methods are wasteful, Sir William will advocate an immediate stock-taking of our possessions of potential energy as the first step towards their judicious conservation. This all has a fascinating ring about it for scientific and practical men who are in any way concerned in our stores of energy.

In the Engineering Section, we shall again come in contact with the question of energy. There is to be a discussion on the respective merits of superheated steam-engines, suction-gas plants, and Diesel engines, upon which subjects papers will be contributed by Captain H. R. Sankey, Mr. W. A. Tookey, and Mr. Charles Day. Will there not be anyone at the meeting from our own industry to say a word for town gas? This British Association meeting is left far too much to the competitors of town-gas in relation to power supply. It may be expected, however, that the exponent of the virtues of the Diesel engine will have something to say upon a topic that formed the subject of a paper before the recent meeting of the German Association [see *ante*, p. 106] —that is to say, the use of gas oil tar or coke oven or vertical retort tar in this particular type of engine. Ordinary gas tar does not appear to be so applicable; and the reason is not very far to seek. Vertical retort and coke-oven tar contains less naphthalene and free carbon than the tar from horizontal and inclined retorts. Therein is the secret. In regard to gas oil tar, a correspondent informs us that it is at the moment at a price above which it does not pay to use it in the Diesel engine. This same correspondent says he has studied the question of gas oil tar fairly well in Germany; and there is not the slightest difficulty in running with such bye-products, providing a mixture is formed containing from 5 to 10 per cent. of petroleum residue. That is a point on which more should be heard.

Labour's Interests.

WHAT with labour wars and rumours of labour wars, and all their disconcerting influences, combined with the prominent position occupied by projected labour legislation in Parliament, and in relation thereto the schism in the labour party and the revolt of a portion of the latter against the Government, we cannot possibly lose sight of the fact that labour is a force among us that is increasing in its might. It is a pity, however, that, while, rightly or wrongly, Parliament is seeking to place labour upon a curiously composite legislative foundation, certain sections of labour should be showing so extensively through the country how lightly they hold in respect even the common law of the land and the rights and property of other people. While such things are going on, labour cannot expect that the country will look with any great amount of sympathy upon the legislative schemes that are framed (again rightly or wrongly) with the view of modifying the more austere conditions of life. But to the onlooker a singular aspect of the present conditions is that the more we have of legislation specially directed to alleviating the troubles and conditions of labour, the more unrest and dissatisfaction appear in its ranks. The more legislation, too, the more evident is it that grievances and wants grow. The insatiety is only equalled by that of the arid desert in respect of water. While the Insurance Bill has been in full parliamentary swing, and under sharp debate, some of the advanced Socialists of the Labour Party have introduced a Bill to create a new Government Department with a Minister of Labour at its head. In his department, all matters affecting labour are to be concentrated—if the measure passes. Among the work to fall to the lot of the man who will occupy this unenviable office is to be that of better organizing the labour market, and to make provision for the prevention of unemployment. It is quite improbable that the Government will give support to this measure at the present time; but if they did, and if the occupant of this new ministerial office could prevent, or approximately prevent, unemployment, then away goes the standing argument for insurance against unemployment. There is a good deal of overlapping in legislative enactments (passed and on the table) in respect of labour; and before many sessions are over our heads, there will surely have to be co-ordination and consolidation. However that may be, one of the other proposals of the Bill before us is that there shall be established a general minimum wage for daily workers—30s. per week is mentioned. For the Minister of Labour, £5000 is proposed as the "minimum wage." If ever he is appointed, he will richly deserve it, as well as all the sympathy that the country can give him.

Itinerant Commercial Agents from Abroad.

GAS engineers and managers have their hands pretty full in these days; and they have to protect themselves against any undue trespass on their time, and personally do their share in preventing any abuse of business privileges by declining to tolerate a system of trading which is not, from our way of thinking, of an altogether legitimate order. Between the particular matter in mind and the last Patents Act, there is some connection. One of the purposes of the Act was to ensure, in return for the protection afforded by the country to a new invention, a satisfactory degree of manufacture and operation on British home territory; otherwise, unless there be some substantial reason to the contrary, the country claims the right to end the protection afforded. There has grown up in our midst a system that has obtained strong root, whereby cute and active agents come over from other countries, and without office or other established place of business in this country—by merely making their headquarters for a day or two at hotels in good centres—travel the country for orders for goods, which are sent direct to those who patronize them from the country in which they are produced; and upon these people there cannot be any very secure hold.

There are two objections to this method of doing business. These travellers from other countries endeavour to inflict their attentions upon busy men at all times; and being foreigners, and exemplary in courtliness so long as it serves their purpose, use fact and manner to force their way into the presence of officials of undertakings large and small—not only gas, but other concerns—so as to secure orders. We have heard of travellers from abroad who have for a long period now been soliciting orders for tool steel. We use this as an example only. Their attentions at the present time are being directed to the officials of gas undertakings. Their method appears to be to get an interview with a gas engineer, to show sheafs of correspondence containing trial orders (some, we believe, rather remote in date), to flatter the object of their immediate attentions by references to the fame of his successful work, to urge an immediate order, and, if it is not forthcoming, there is a traceable modulation of tone, or, if an order is promisingly imminent, its immediate delivery to an hotel address is requested. If there is no fairly certain prospect of an order—this was so at all events in one case of which we are aware—there is an attempt to recover possession of the papers handed to the person interviewed. In one instance, a gas engineer noted the names of two or three *confrères* who had given sample orders; and, after his visitor left, he inquired of the professional friends as to the genuineness of them. All were correct, except that there was agreement, after making trial of the steel, that its boasted pre-eminence in quality was not justified, and that they could have obtained English-made steel of superior quality at a lower price. That was their opinion; and they stated it for what it was worth. No fraud is imputed. It is a case of business men obtaining the best price that they can for the goods they offer. The first objectionable aspect of the business is the trespass upon the time of busy men by this expansion of the personal interview system of cultivating trade by people whose commercial centres are situated beyond our own shores.

This brings us to the second objection. The system of which complaint is made is spreading. It is not confined to steel in the gas industry; and it is just as well to early do something to discountenance it. We believe in freedom in trade. At the same time, we encourage a sense of patriotism; and, in commercial transactions, there is nothing like having a home connection with those with whom business is done. If these people want to do business with British gas undertakings, let them come among us, and establish proper business centres here, as others have done before them, and have cut out for themselves, by sound commercial methods, a recognized position in our midst. Until these other people do the same thing, then, unless they can satisfy that they can supply something surpassing the merits of the same class of goods in this country at a price that adds to the lustre of the merits, then gas engineers should decline to have their time wasted by the travellers (who are here to-day and will have flitted to-morrow), and confine their patronage to firms with established business centres in this country. It is clearly the safest course to pursue.

Steam-Roller Question Again.

The County Councils of the country seem to have taken a determined attitude to place fresh burdens on the use by gas undertakings of the main roadways over which the Councils have authority; but at every turn in Parliament this session, they have been defeated. It will be remembered that the tale of the session's doings include applications, on the part of the Staffordshire, Warwickshire, and Middlesex County Councils, for unreasonable impositions on Gas Companies' concerns in relation to their pipework. But they failed all along the line. Now comes (as reported a week ago) the Uxbridge Gas Company's Order. The Buckinghamshire County Council agreed with the Company to road protection in terms similar to those settled with the Middlesex County Council some five years since. But the Hertfordshire County Council wanted the steam-roller clause (which has only been a matter of agreement heretofore); and they asked to be exonerated for all damage done if the weight of the roller did not exceed 20 tons. The House of Lords Committee before whom the Order Confirmation Bill came were unable to see eye to eye with the County Council, and so they failed to get what they desired.

Coronation Illuminations and Consumption.

The unbroken march in financial strength of the Gaslight and Coke Company as revealed by the notification of their dividend for the past six months and the balance forward led the "Financial Times" to cast around for reasons; and it alighted on the suggestion that the Coronation illuminations were doubtless responsible for a portion of the improvement shown in the net profit. It is no doubt the view of many that the illuminations were good

things for both gas and electricity suppliers. But a little consideration as to the stoppage of business in London for two whole days, with shops, offices, and factories completely closed, and the streets more patronized than homes, must show anyone that the normal course of things rather than the abnormal would have been preferable from the trading standpoint for both gas and electricity suppliers. Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, has written to our financial contemporary to correct its impression. He remarks: "In reality, the Coronation holidays occasioned a very serious drop in the ordinary consumption of gas, which was not nearly counterbalanced by the gas consumed for illuminations. The only satisfaction in this is that it proves the increase in business is due to general causes rather than to an exceptional one."

The Position of the Municipal Engineer.

Some aspects of municipal engineering as a profession have been dealt with in the course of a short paper read by Mr. B. Wyand before the Institution of Municipal Engineers. Pointing out that in every direction now municipal trading is being extended, the author remarked that these schemes mean more responsibility for the officer, and the necessity for a better class of officer—a more highly-trained and a more intelligent man. This, again, means higher salary, larger staff, and better accommodation, together with the less frequent requisitioning of the consultant. Referring to a subject on which there has been much talk of late—"improving the status of the profession"—Mr. Wyand argued that the term is a misleading one. What is wanted is to improve the status of the members of the profession; and every man who realizes that he is an adviser, and not a servant, is working on right lines. Municipal engineers must feel their responsibilities, and recognize the fact that supremacy is their place in local life. "Even the chairman of the council," said the author, "is merely a cypher when contrasted with the municipal engineer; and he should, as far as possible, be made to feel this. The chairman may be the better man in many ways; but when it comes to engineering, he should be made to recognize the fact that he must play fourth fiddle, and must feel happy that he has not been relegated to the orchestral triangle. A man is estimated in this world much at the value he places on himself; and the humble, shrinking individual who is led by his council is never likely to command either respect or a periodical increase of salary. The blatant gentleman who boasts freely is much more likely to succeed for a time; but his day is not usually a long one, and he is the last man to make capital out of a reverse of fortune." Security of tenure was the next matter touched upon; and on this Mr. Wyand remarked that he would say nothing harsher of councillors than that they are entirely unnecessary, and that he is sadly afraid security of tenure will be difficult of attainment so long as district councils exist. The sole duty of the council, he argued, should be the making of the rate; and this could be as well done by one man as by twenty. Directly a council concern themselves in engineering matters, they become ridiculous; and the effect of their interference is to hamper the technical officers. The suggestion of the author is that the officers "should be appointed by a central controlling authority, and should be removable only for misconduct, or at an age when a pension (and a sufficient one) falls due. Their appointment would, in fact, be a life one, with promotion to larger appointments as vacancies occur. They would be responsible to the central department only, just as are police and post office officials." Among other things, Mr. Wyand is of opinion that municipal engineers are usually woefully underpaid and overworked. He places municipal engineering at the top of all the professions; and concludes with the assertion that the time has arrived when the municipal engineer must take the place which is his by right.

Exhibitions.

The electrical industry are very much alive over their electrical exhibition to be held at Olympia from Sept. 23 to Oct. 21. They are hoping for great things from it, as they hoped for great things from the last one held in the same place. It is a pity for them that they chose such a bad year for the show—bad because there are so many counter and more imposing attractions beckoning the public. Throughout the summer gas is being well represented at the Festival of Empire and the Coronation Exhibitions—even to the generation of electricity for lighting and power by the use of town-gas driven engines. Only at the fag end of the summer and the beginning of the autumn, there is to be this electrical exhibition at Olympia. The list of exhibitors at present includes about 190 firms, and in addition a dozen or so trade newspapers will occupy floor space—for what purpose other than to supplement the exchequer of the exhibition promoters, we fail to see. However, they are contributing their share.

Gas and Death by Easy Stages.

Weekly, daily, and other newspapers which do not get sufficient material locally or through their advertisement connection to fill their columns, frequently have recourse to one of the news or magazine agencies which supply for a price any quantity of columns of matter in "stereo" form, which matter has been prepared by men who specially lay themselves out for this particular class of popular work. In this way, such writings obtain a wide circulation. In notes of this type there are at times found some curious things. We suppose "Robert Watson, M.D.," is a gentleman who supplements his income by writing notes of the kind for general consumption—at all events, it looks like it, seeing that a column of notes on "Health and Home," bearing his name, is found in papers as far apart as the North of England and South Wales. Dr. Robert appears to like to play a little upon the string of sensationalism. He has a paragraph about gas-cookers in an article before us, but little is found in it about these useful and almost universally used contrivances. "Every leak by which gas escapes," he says, "is a definite source of injury to health. Even a short exposure to a trivial escape *kills* (there is no other word for it) a portion of your body." Horrible man this to adopt such methods of trying to frighten the public. In the first place, there ought not to be gas escapes in house fittings. In the second place, the thousands upon thousands of gas workers, who are constantly living in an atmosphere containing more or less of the gas to which Dr. Watson refers, are notorious for their good (among industrial workers) average length of life. We have known gas workers who have so lived for fifty and more years, and have retired to enjoy and are enjoying their pensions. But, according to Dr. Robert Watson, they ought to be dead instead of now restfully spending life. They ought to have been killed little bit by little bit, until now they ought to be no more.

And Tortures While Alive.

Not only so, but during their long working years, they ought to have suffered tortures. They ought to have suffered from "headache, turns of dizziness, want of energy, want of will, alarming weakness, neuralgia, indigestion, and sleeplessness." In fact, so terrible ought to have been their experiences that they ought to have been glad to have known that they were about to shake off their mortal coils. Why gas making, under the circumstances, should be an occupation much sought after is another mysterious thing; and it points to an old-standing human idiosyncrasy. We do not mind so much Dr. Watson's warnings regarding householders ascertaining that the connections of gas apparatus are sound; but he has had some experience which assures him that "a test to the average connections of a gas-ring or gas-iron would reveal a flaw in seven cases out of ten. So lightly are life and death considered by most of us." This is really nerve-racking. But gas-fitting must be badly done in this "M.D.'s" part of the country if it is so fruitful in leaks as he declares. But we cannot award Dr. Watson the biscuit. The "Dundee Advertiser" recently contained a letter signed "Hygiene," in which it was stated that "it is not perhaps generally known that the gas supplied in Dundee contains a very deadly poison—viz., water gas, *or* carbon monoxide, a *single whiff of which, if inhaled, will cause immediate death*." Who wrote this? The men on the top of the water-gas generators are bearing false witness against "Hygiene" by the number of "whiffs" they have had, and continue to indulge in, and yet persist in living.

South Metropolitan Gas Company's Dividend.—We learn from the Secretary of the South Metropolitan Gas Company (Mr. F. M'Leod) that the accounts for the six months ended the 30th of June will, subject to audit, allow of the payment of the full statutory dividends, and increase the carry forward to nearly £120,000.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 248.)

LAST week was a very disappointing one on the Stock Exchange. It commenced well and, by way of a sharp contrast from what had recently ruled, the gilt-edged was the strongest market. This was largely due to the extreme abundance of money, but not even this once powerful factor could keep Consols up in face of the increasing difficulties of the Morocco situation and of developments in Home politics. With labour questions and other troubles, it is no wonder that prices crumbled away. Monday was about the best day of the week, thanks to the agreeable change noted above. Rails, Americans, and Foreign were all pretty good; but the last prices were not the best. The weakening tendency was in force on Tuesday. Consols fell $\frac{3}{16}$, and the other markets were down, too—the announcement of a couple of failures not making things happier. Misgivings as to the Morocco position ushered in Wednesday and made prices weaker. Government issues were quite flat, and Rails fell partly in sympathy and partly on their own worries. But Americans were strong, and the rest recovered somewhat before the close. Thursday was depressed by the reported German demands in Africa, and every market was more or less affected. Apprehension continued on Friday, and much heaviness prevailed. Consols were done at 78¼, and Rails were weaker. Saturday was very inactive in the intense heat, and the tone was thoroughly dull. Consols closed at 78¼-78½—a loss of $\frac{5}{8}$ in the week. In the Money Market, the commodity was cheaper than ever, so superabundant was the supply; but discount rates were rather harder. Business in the Gas Market was a pretty fair average in the aggregate; but the bulk of it was in a few concerns, and the rest were left very much alone. In Gaslight and Coke, the announcement of an increased dividend with a carry-forward of nearly £700,000 gave gratification; and the price rose from 107 on Monday to 108 on Friday and Saturday. In the secured issues, the maximum marked from 85⅜ to 86½, the preference from 103½ to 104½, and the debenture from 79 to 80. In South Metropolitan there was not much doing, and prices were close at from 119¾ to 120¼. The debenture realized 78½. In Commercials, only the 4 per cent. was touched, and that changed hands at 114¾. Among the Suburban and Provincial group, Alliance and Dublin was marked at 83, Brentford new at 205½, Southampton at 107 (a fall of 2), and Tottenham B at 118. In the Continental companies, Imperial showed a continued disposition to easier figures, changing hands at from 185 down to 183 (a fall of ½), and European was firm at 19¾ and 20. Among the undertakings of the remoter world, Bombay was done at from 6⅜ to 6⅝, Primitiva at 7⅜ and 7½, ditto preference at from 5¼ to 5 7/16, ditto debenture at 97⅜ and 98, San Paulo at 21½, and ditto debenture at 49 15/16 and 50—a rise of ½.

ELECTRICITY SUPPLY MEMORANDA.

Nothing to be Left for the Gas Industry—The House of Peace and Plenty—Electricity Lessens the Butcher's Bills—Explanations Wanted—Cooking Costs—Sandwich Men and the Poison Slander—Candle Power Inside and Outside the Laboratory.

IN last week's "Memoranda" attention was directed to the fact that a benign writer in the "Electrician" had most generously handed over to the gas industry the provision of heat for the cooking and house warming of the country; but he claimed that the lighting was ear-marked for the electricity industry. Unfortunately for the gas industry, the writer referred to is not the only literary pebble on the electrical littoral; and, if we piece together the views that are prevalent among the electrical writers, and have any belief in their prophetic powers, then we must begin to prepare for a rapid and permanent closing of the progressive and prosperous career of the gas industry. The lighting business, we are told, on the one hand, has got to go from the gas industry (the municipal electrical engineers meeting at Brighton recently thought that some of their own lighting was taking a wrong turning); while, on the other hand, another writer in the "Electrical Times," blessed with superhuman foresight, asserts that "the electric cooking era is not so far distant as many electrical men think, or as the gas people would wish." This looks bad. Then we are confronted with something else that is not intended to conduce to our peace of mind. It is that "developments in the design of cooking apparatus have been very rapid during the last year or so, and evolution is taking place on the lines of greater efficiency, simplicity, and fool-proof design." There was room for something of the kind. But worse and worse for the gas industry. A householder at Ealing has been using the "Tricity" cooker, and has found that the waste of meat (by weight) may be halved by using this wonderful contrivance of the Berry Construction Company. It is a matter of immense importance; we cannot lay too great stress upon it. By adopting electricity (the definite cost of doing so is not published) for cooking meat, a man may indulge in a larger family, and yet not spend more on his butcher's bill, because the heat of electricity is different from all other heat, and does not cause such a great amount of waste in the weight of a joint. The butchers will not like this economy that electricity introduces; but from the national point of view, it is a matter of which we must not lose sight. Butchers, like gas shareholders, must treat the matter in an altruistic light. Putting the matter in another way, the makers of the "Tricity" cooker point out that "in money value this means that, out of every £50 spent with the butcher nearly £17 is lost in the cooking process when gas or coal is employed; and one-half of this loss—*i.e.*, £8 10s.—can be saved by cooking meat electrically."

Now, in the figures supplied by this householder at Ealing (he appears to have had in his house simultaneously and quite recently the means of cooking by coal, gas, and electricity, so that he must surely be a millionaire), out of four tests—three with coal, and *one only* with gas—the percentage loss in weight of the meat in the gas test is worse than in one test with coal, and only slightly better than the results in the other two coal cases. It is a curious thing that only one test is recorded with gas; while there are five with the "Tricity" cooker. However, this is an unsolicited testimonial on the part of this particular Ealing householder; and this Ealing householder must be an excellent, good-natured individual, for he went to a good deal of trouble to obtain the material for the unsolicited testimonial, by weighing meat before and after cooking. We hope the Berry Construction Company have been truly thankful. It is not supposed that all the meat that was cooked in this household was weighed during the five weeks over which the tests ran; seeing that sometimes just about a week elapsed between the tests. But there are indications that this must be a large family, or the members of the household mayhap are heavy-handed with meat, or perhaps the dwellers in the house of Mr. A. Haynes, of 25, Woodfield Road, Ealing, are fond of cold meat. We cannot say. But it is observed that on March 23 ribs of beef, weighing 5 lbs. 7 oz., were cooked; on March 26 a leg of mutton, weighing 8 lbs. 8 oz.; and on March 29, a shoulder of mutton weighing 6 lbs. 13 oz. On April 15 we have a shoulder of mutton cooked weighing 4 lbs. 12 oz., and next day, ribs of beef weighing 9 lbs. 1 oz.! This is a house of peace and plenty. We see that the leg of mutton that gas condescended to cook weighed 8 lbs. 4 oz. when in the pristine condition in which it was received from the butcher; after the oven had done its work (we should say worst), it only weighed 6 lbs.—a loss of 2 lbs. 4 oz. A leg of mutton weighing 9 lbs. in its original condition, when cooked in the "Tricity" oven weighed 7 lbs. 12 oz.—a loss of only 1 lb. 4 oz. Another leg of mutton did not fare so well in a "Tricity" cooker. It weighed 9 lbs. 1 oz. before being cooked, and 7 lbs. 10 oz. afterwards—a loss of 1 lb. 7 oz.

There is no explanation given of this particular phenomena. But it is all very silly. There is no reason why a gas-oven should waste the meat to any greater extent than an electric oven. The heat inside a gas-oven is a moist heat; and by the exercising of normal care, and not over-cooking the meat, the weight should not be less than if treated in an electric oven. For comparison purposes, it is quite possible for an oven to be hard-driven and the meat cooked almost to a cinder; and it is quite possible for another joint to be underdone. We should have liked to have seen the joints of April 2 and April 9, before and after cooking. It is hoped Mr. Haynes is not getting angry. No aspersions are intended. Our respective views as to overdone and underdone meat may vary. The views in our respective households as to how to cook meat may vary. The whole world, in fact, in its habits and practices differs very largely. But this all takes us back to the early days of gas cooking, when it was claimed that meat cooked in a gas-oven lost less weight than meat cooked in a coal-heated oven; but gas-ovens have made such headway, and are so popular, that not much is heard of the claim to-day. It is a case of merit having forced the pace of popularity. It was but a few years since that a gentleman who had made, and was professionally competent to make, an investigation as to the cause of meat properly cooked in a gas-oven not losing so much weight as meat cooked in a coal-heated oven, gave this explanation: "Through the instantaneous action of the heat to the whole surface of the meat to be cooked, the albumen is at once coagulated, and thereby prevents the escape of the juices from the interior, which, on reaching their respective boiling-points, expand the cell fibres, and thus contribute in the interior to that chemical and physiological action and reaction intended with the process of cooking in a more perfect manner than has hitherto been attained by either cooking, roasting, stewing, or steaming of meat, &c."

Will the Berry Construction Company, or Mr. Haynes, of Ealing, tell us whether there is anything wrong about this scientific explanation? Will they further add to the interest and indebtedness that we shall experience by telling us why in a gas-heated oven meat should lose a greater weight, and therefore presumably more of its nutritive properties, than meat cooked in an electric oven? We want a fair explanation, and not a mere writing-round the question. We have given them good reasons why we think they are wrong; and, in the most amiable manner, we invite them to state the reasons for the phenomena which they have not yet ventured to explain. We are not in agreement as to the cost of cooking by electricity bearing favourable comparison with gas and coal. Comparatively, very few people have tried electric ovens; but among those who have are examples of those who have gladly reverted to gas, and not because they found with the electric cooker that "every joint is now most tender, and has the *appearance* of being larger when cooked by electricity, instead of being *drawn* and *shrivelled up* as it is when cooked by gas or coal." Ah! have we discovered here the reason for Mr. Haynes' 8 lb. 4 oz. leg of mutton, when cooked in a gas-stove, yielding up

2 lb. 4 oz.? We think a lady demonstrator from the Brentford Gas Company could show Mr. Haynes and the Berry Construction Company how a leg of mutton can be cooked by gas without being "drawn and shrivelled up." Electricity is a wonderful thing when employed for cooking.

The electrical papers are once again trying to stimulate interest in this cooking business; and reduced meat shrinkage is one of their present pet arguments. It has been trotted out at Dover. What is lost on the roundabouts is gained on the swings. From Dover it is stated that the cost of electric cooking, as compared with gas cooking, is about 25 per cent. more; but "the less shrinkage of joints with electric cooking makes the increased cost only 15 per cent."—that is to say, the problematical saving in meat (in which the skill or desire of the cook plays part) only reduces the extra cost of cooking by electricity by 10 per cent. on the terms in existence at Dover. It is not stated that the electricity cooking prices are generally in the region of 1d., 1½d., or 2d. per unit, while the prices of gas used for cooking are at the rates charged for lighting; nor is it mentioned that about 3420 B.Th.U. is the thermal value of a unit of electricity, while a pennyworth of gas, at 2s. 6d. per 1000 cubic feet, represents approximately 16,500 B.Th.U. The electrical people are not quite at home in this matter yet. The same paper that spoke of this 15 per cent. difference in cost (the modesty is admirable) states, in another recent issue, that the "Tricity" oven is made of light material with a bright surface. The metal has only a small capacity for heat, so that the interior quickly arrives at the working temperature, and the loss by radiation and convection is small. "The consumption of energy is remarkably low; it enables electricity to *compete with gas for cooking, even on the score of cost alone.*" Up to the present few people have been found to believe the fairy tales on this subject. We see, too, in one of the newest forms of cooker—the "Eclipse"—that a sort of "danger" lamp is used. A ruby indicating lamp, says one description, is provided to show when the cooker is on circuit, and to serve as a reminder (we can see the cook or the cook-general paying much heed to it) to the user to turn off all switches (including the main switch controlling the cooker) when the cooker is not in use. It is also remarked that the heating elements consist of round or flat wire, wound on to mica strips, which have a life of 3000 or 4000 hours, and cost about 1s. 6d. each. This oven is the nearest of all comers in appearance to a gas-oven. Its consumption is rated at 2 units per hour; and one paper says a 4½-lb. joint can be comfortably cooked for 2d. at 1d. per unit. But there are the vegetables; and the boiling-ring and the hot-plate and grill each consumes 800 watts per hour. There are also the sweets. And yet some people think that electricity can compete with gas for cooking even on the score of cost alone! This is one of the ripest examples of human credulity that we have ever met with.

The "Electrician" states that sandwich men have been parading the scene of the late Incorporated Municipal Association convention, at Brighton, announcing that reliable electric lamps can be purchased at 2s. 6d. (230 volts) and at 2s. (115 volts). The lamps in question are stated to be supplied by the Gabriel Lamp Company. There is no objection to the method of advertising from the gutter the prices of electrical commodities. But our contemporary proceeds to state—

> The fight with gas has been borne in mind in the lettering on the sandwich boards; the passer-by *being admonished upon its use and warned not to poison himself by allowing it in the house as an illuminant.* As far as we ourselves are concerned, we have no opinion to express.

We should like to know whether the Electrical Engineer of the Brighton Corporation (Mr. John Christie) in any way countenanced the exhibition of these sandwich boards with the "admonition" and "warning" upon them either personally or as an official of the Corporation. We should hardly think so. The Brighton Gas Company, however, will do well (they no doubt know who are directly responsible for the boards) to make a strict investigation to ascertain whether, in the event of any gas consumer turning over to electric lighting about this time, the "admonition" and "warning" were the persuading causes. There are ways and means open for dealing effectively with any material damage that may be suffered through injury to business by the circulation of malicious slanders. Besides which the Brighton Gas Company have a legal right (conferred upon them and frequently confirmed by Parliament) to carry on the business of gas suppliers, for lighting, heating, cooking, motive power, and all other purposes for which gas can be usefully employed.

Our electricity contemporaries have grasped eagerly, and almost feverishly, a report from America. Reports do occasionally come from America. This report not only comes from America, but its source is the National Electric Light Associations. There is nothing new about reports regarding gas emanating from electrical associations. This particular report mentions that not more than 60 to 70 per cent. of the laboratory rating of candle power can be obtained from gas-lamps under service conditions. This is not so bad as certain electrical contemporaries and electrical advertisers who have allowed incandescent mantles to have an efficiency of about 4 or 5 candles per cubic foot of gas consumed. It is stated that the American tests have been borne out by tests made by gas engineers. Who are the gas engineers? And what burners did they use? If certain results can be obtained in the laboratory with incandescent gas-lamps, they can be realized elsewhere, and maintained by occasional attention, if the gas-supply conditions are the same as those ruling in the laboratory Is there any reason why they should not be, Mr. "Electrician" and others? Of course, the metallic filament lamp, according to electrical faith, carries its laboratory results loyally into service. However, the testimony from America is not to be despised. Assuming, in service conditions, that 70 per cent. of the laboratory result is realized. An inverted lamp giving 100 candles on 4 cubic feet in the laboratory would afford 70 candles in the house. The lamp would not absorb 100 cubic feet, costing 3d. or 4d., in less than 25 hours. A 70-candle power metallic filament lamp would run away with a unit of electricity, costing 3d. or 4d. (perhaps more), in 11½ hours. Thanks Mr. "Electrician" and others for the testimony to the economy of gas.

PERSONAL.

During his visit to Edinburgh last week, His Majesty the King conferred the dignity of knighthood upon Mr. W. S. Brown, the Lord Provost of Edinburgh, and Mr. Archibald M'Innes Shaw, the Lord Provost of Glasgow. Both gentlemen are the nominal heads of the Gas Departments in their respective cities.

An interesting ceremony took place last Wednesday, at the office of the Ipswich Gas Company, when the officials assembled in the Board-room to bid farewell to another of their colleagues —Mr. W. E. Free, who, as already announced in the "Journal," has been appointed Secretary to the Windsor Royal Gas Company. In the unavoidable absence of Mr. J. T. Jolliffe, the Secretary and Manager, Mr. Frank Prentice presided, and mentioned that no less than three of the Company's officials had left them in as many months, to fill better appointments. He heartily congratulated Mr. Free on his success, and asked his acceptance from his colleagues of a handsome marble clock as a token of their good-will, and with their best wishes for a successful career at Windsor. After a few words from Mr. G. A. Mallett, who expressed gratification at seeing some of the members of the staff obtaining such good appointments, Mr. Free made a suitable response. He alluded to his long and pleasant connection with the Company, and acknowledged the kindness he had ever received from those associated with it.

OBITUARY.

The death has been announced, in his 57th year, of Mr. Henry Howell, the Manager of Howellite, Limited, of Farringdon Avenue, E.C. Deceased was one of the veterans of the incandescent lighting industry; having been connected with the old Welsbach Company in its early days. He was the inventor of several improvements in connection with incandescent gas lighting; his latest success being the Howellite inverted burner.

We regret to record the sudden death, last Sunday afternoon, as the result of heart failure, at the age of 65, of Mr. H. W. Amos, the Secretary of the Bromley and Crays Gas Company—a position he had filled for 21 years. Originally, the offices of Secretary and Manager were held by Mr. G. H. Osborn, on whose death in 1890, after 35 years' service, they were divided; Mr. Amos, who had been with the Company since 1863, and was then the Chief Clerk, being made Secretary, and Mr. W. Woodward, of Bury, being appointed Manager. Mr. Amos was highly respected, alike by the shareholders of the Company and by the residents in Bromley. He was a Deacon, and for several years past had been the Secretary of the Congregational Church, from the pulpit of which the announcement of his death was made at the evening service. He was well known for the keen interest he took in politics, being a staunch Liberal; and he was an active member of the Bromley Bowling Club.

Irish Association of Gas Managers.—The annual meeting of the Association will be held in the Queen's Hotel, Queenstown, on the 8th prox., under the presidency of Mr. John Paterson, the Manager of the Queenstown Gas-Works. According to the programme issued by the Hon. Secretary and Treasurer (Mr. George Airth, of Dundalk), the business will include the President's Address, the reading of three papers, and (time permitting) the discussion of two suggestions. The following are the titles of the papers: "Notes on Purification," by Mr. A. Percy Hoskins, of Belfast; "The Construction and Working of a Small Sulphate of Ammonia Plant," by Mr. T. Hornby, of Longford; "Gas Apparatus for Workshop and Laboratory Purposes," by Mr. G. F. Hurst, of Birmingham. The subjects suggested for discussion are: "Is the improved upright incandescent burner better than the inverted for ordinary gas pressures?" and "The best means of disposing of tar, in view of the deterioration in prices lately." A pleasant incident of the meeting will be the presentation of an illuminated address to Mr. James Whimster, J.P., of Armagh, for his long and valued services to the Association. A new honorary member will be elected; and Mr. J. E. Enright's proposition (brought forward last year) to alter the date of the annual meeting, will be considered. Opportunity will be afforded the members of inspecting the Cork Gas-Works, where De Brouwer machines, with coal and coke handling plant, have lately been installed. On Wednesday, the 9th, there will be an excursion to Youghal, with luncheon at the Green Park Hotel, and a steamboat trip on the Blackwater.

THE SUGGESTED STANDARD SPECIFICATION OF STREET LIGHTING.

[COMMUNICATED.]

FOLLOWING the reference in the recent report of the Council of the Institution of Gas Engineers to the proposed standard specification for street lighting, the replies to the inquiry instituted by the "Illuminating Engineer" [see *ante*, p. 99] will be read with some degree of interest by all those who are concerned with public lighting matters.

According to the Institution Council's report, the preliminary and fundamental points under discussion by the Street Lighting Specification Joint Committee had regard to the unit, whether of light or illumination, which should be the basis of the contract. Sequent to an expression of opinion in favour of illumination with the foot-candle as the unit, discussion took place as to the method of determining or testing foot-candle values; and it was stated that some difference in opinion occurred as to whether these should be determined on the horizontal plane or on the plane facing the light rays tested. The inquiry of the "Illuminating Engineer" covers these and other debatable points; and the replies received from authorities (principally electrical and professorial) living and practising abroad, suggest that agreement in views is not likely to be achieved at once, the problems involved in street photometric practice being far from easily solved. The inquiry, however, is not complete; other communications being expected. It will be noted that opinions from home lighting experts, from their point of view and for English conditions, have still to be obtained.

It is acknowledged that in dealing with a subject like public lighting, where not only light-sources vary considerably in design and distributive effect, but where the streets themselves differ in importance, character, and adaptability, the application of tests and standards to all conditions alike may not be easily possible. It is not surprising to find, therefore, that the replies to the "Illuminating Engineer" queries suggest that there are obstacles in the way of the evolution of a standard specification which will afford satisfaction to all parties. In any case, it is certain that the difficulties of (to speak of nothing else) properly appraising the value of light-sources and the resultant illumination, having regard to the varied needs of the several types of thoroughfares, are such that very careful thought will be required before asking public authorities to adopt definite specification clauses for general lighting purposes. Abnormal and unnecessary trouble may easily be occasioned, and possibly grave injustice done, to either the contractor or the public or both; and, when once standard specification clauses are issued, it will not be altogether easy, without reflection on the orginators, to modify them afterwards.

The "Illuminating Engineer" has so far obtained ten replies to the questions advanced, and the extent of agreement obtained is indicated in a table published in the number containing them. With reference to the first query, practically all the correspondents are in accord that the proposed specification should contain a statement of the energy or gas (as the case may be) consumed, and the amount of light furnished. So far as the amount of light is concerned, five are in favour of a "certain actual minimum illumination in the street;" while four wish simply for "lamps of a certified candle power." Assuming an "illumination" basis be generally accepted, nearly all favour the suggestion of measurement on the horizontal plane at a stated height above the ground. As already indicated, however, several had expressed their preference for lamps of a certified candle power, and they therefore qualify their replies to this query—evidently regarding the method as insufficient, and wishing it to be either supplemented by the vertical-plane measurements or else preceded by laboratory tests. Even the advocates of the horizontal illumination tests consider it desirable to have the latter.

It may be noted in passing that the illumination test in query No. 3 deals with the measurement on the horizontal, the vertical, and the 45° inclined planes. There is no reference to a test made at right angles to the light-ray, which should also have had some consideration.

In the case of measurement of the intensity or candle power of the light-source—as an alternative to that of illumination—the fourth query is directed to tests of the (*a*) mean spherical, (*b*) mean hemispherical, or (*c*) specified angular candle powers; and here opinion is divided between the second and third methods. The imposition of a test of the "constancy of the candle power of the lamps" in use does not meet with any great favour; nor does the suggestion of stipulations as to the height of light-sources, or their shading. The idea of prescribing any specific colour for the light does not receive acceptance.

From the above brief analysis, it will be noted that the authorities so far consulted consider that street lighting specifications should state both the form and the amount of light to be furnished. But, although there is some feeling in favour of the prescription of a "certain actual minimum horizontal illumination," very few care to do without supplementary laboratory tests of candle power or vertical-plane illumination measurements; the inference being that horizontal plane tests alone do not afford all the information necessary. In this connection, therefore, it is useful to read again the remarks of Dr. Louis Bell, of Boston, and of Mr. P. S. Millar, of New York. The former does not believe in the specification of illumination in any form as the basis of payment in a municipal contract; and he points out—and in the writer's opinion rightly—that the measurement of minimum illumination under some conditions of spacing could only be an approximation, and that the easily possible differences of 5 to 10 per cent. in tests made by the two contracting parties are likely to involve no inconsiderable sum when it comes to payment. On the other hand, the provision of a specified minimum candle power ensures that at least a certain minimum flux of light will be available, and it is simply a matter of using it to the best advantage. Mr. Millar also emphasizes the objection—stating his belief that illumination measurements on any single plane do not tell the whole story; and he remarks that where photometric tests are involved in a contract, a reasonable non-penalty margin should be provided, in order to allow for "inherent variables and fallibility of tests."

It is true that the advocates of the horizontal-plane test have shown their faith in the method by supporting the recommendation of the Verband Deutscher Elektrotechniker, which specifically makes mean horizontal illumination measured at a height of one metre above the ground level, the practical measure of the illumination of outdoor areas and interiors, but requires also the determination and statement of the maximum and the minimum illumination.

One argument which has been advanced in favour of the principle is that, from the point of view of the buyers, an exact knowledge of the candle power of the light-source is not so much desired as that of the illumination actually received. This may be true; but the proposition to pay by results—to purchase effect rather than the factor itself—is an unusual one, and is not made in other and ordinary lines of business. No butcher or grocer, for instance, bases the price of his commodity upon the effect it has on the physique of his customer. Some commonsense in usage is expected on the part of the latter individual. It is further suggested that while vertical illumination is not unimportant, the horizontal-plane test practically serves both purposes, since the former is nearly always greater than the horizontal illumination. The undoubted ease, however, with which the horizontal-plane test can be made, has probably had much to do with its ready acceptance. There is nevertheless something, and in the minds of some people a good deal, to be said against the method.

The horizontal screen obviously takes into cognizance not only the light received from all the lamps in the vicinity, but also that from any neighbouring shops. It is also affected by reflected light from houses and walls to varying extents, according to their position, nature, and colour, and even by the condition of the atmosphere itself. The readings are usually much lower than those of a direct-ray reading instrument, and are capable of a greater range of error—a trouble which may be further accentuated by the fact that the inadvertent tilting of the screen is in itself a source of inaccuracy. On the latter score, it has been stated that 1 or 2 per cent. difference in level may cause an error of 10 per cent. in the result.

Differences in the value of the readings—due to varying distance and the Purkinge phenomenon—are also liable to be caused by the alterations in the spectra of one or more of the several lights concerned. Apart from these difficulties, the method is not a consistent one, since the horizontal testing-screen is affected by oblique light when (say) midway between two lamps; but as it is brought close under any single lamp, it takes less cognizance of this light, and virtually becomes a direct-ray testing-plane.

One or two of the objections alluded to are advanced even against direct-ray testing, but admittedly with not the same force. It is stated, for instance, that reflection effects are still possible. These, however, are relatively small, and may, as a matter of fact, be practically avoided by shielding the testing-screen.

On the face of it, if "illumination" is to be the basis of a street-lighting specification, it is advisable in the test adopted to reduce the number of "inherent variables," and to lessen the possibility of test "fallibility"—to use Mr. Millar's phrases. And for this reason, and in the belief that the method is at once more useful and equitable, the test or computation of direct-ray illumination is preferred by some. It is more useful because it is probably a better index of the illumination which is of most service in the streets. While uniform lighting is advisable, the light principally in request is that for seeing the faces of people, vehicles, steps, and obstacles generally. The method is more equitable because, so far as the lighting contractor is concerned, it is less subject to photometric and experimental error, and it can be made to be totally independent of surroundings. It is also much more convenient for purposes of practical work. A contractor is asked to provide certain illumination for certain streets. If his work is to be judged by direct-ray foot-candle values, he may set up an experimental lamp in his own workshop, and vary the design of both lantern and reflector until he obtains a satisfactory distributve effect. He may then from the polar diagram plot out a scheme on any ordinary Ordnance survey map which will fulfil the conditions of the specification, and tender with the assurance that the results are not going to be influenced by adventitious circumstances such as the nature and width of the street, or the presence of trees and walls. This surely has the additional advantage of encouraging makers in their

work of improving and even standardizing lamps, as they have not to go into particular streets to see how far the relative position of various light-sources and buildings is likely to affect illumination results generally or the minimum foot-candle specified.

From the point of view of lighting contractors, the matter is of great importance, since the stipulation of necessarily small and fractional foot-candle values as minima for any part of a street or open space may involve monetary loss, in the way of penalties, founded on what may be at any time very unsatisfactory tests. The latter trouble may be obviated to some extent by making the non-penalty margin fairly wide. But the very existence of a wide margin suggests the uncertainty and the absurdity of the testing method requiring it.

A further advantage of the direct-test method is that there is distinct relationship between the foot-candle illumination ascertained and the candle power of the lamp; and the values are therefore easily convertible. Where tests are unnecessary or inadvisable, as they well may be in the case of the low readings obtainable with widely-spaced lamps in side streets or roads, the polar diagram of the lamps concerned will sufficiently serve the purpose for ascertaining the illumination received; and it is much more likely to be accurate in view of the fact that street photometry is not yet an exact science. With a unit thus so easily converted into candle power, the standardization of specification clauses will be more easily effected and generally accepted, since it is open for contracting parties by agreement to determine foot-candles either by test or by calculation as may be thought best by them.

Speaking generally, if illumination is to be adopted as the basis of future contracts, there would seem to be many practical considerations which favour the direct-ray method of testing; but, at present, it is questionable whether the time is ripe or illumination photometry sufficiently exact for the suggested change.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Reports of Technical Committees.

THE following are summaries of reports not already dealt with [see last week's "JOURNAL," p. 160] presented at the meeting at Dresden last month by the Technical Committees appointed by the Association.

HEATING COMMITTEE.

The report of this Committee, which is signed by Dr. E. Schilling, of Munich, the Chairman, states that the set of prescriptions and rules for the sale and use of gas which had been prepared by the Committee and received the approval of the Association at the general meeting at Königsberg last year (see "JOURNAL," Vol. CXI., p. 34) have been issued in pamphlet form and have met with a large sale. It is hoped that this set of rules will form the basis of any special prescriptions made by municipal authorities and gas-works in regard to gas supply and fitting.

The question as to the participation of the Association in the Hygiene Exhibition at Dresden was dealt with by the Committee in conjunction with the Central Organization for Promoting the Sale of Gas; but, unfortunately, as already reported, the negotiations broke down. It is stated, however, that the Central Organization believe that the discussion in this case has disclosed a way by which the gas industry will be assured of participation in other large exhibitions; and the Committee consider that such questions may confidently be left in future to the Central Organization. The matter of the training of Lady Instructors in gas cooking has been energetically taken up by the Central Organization, with very satisfactory results. Any points which may arise in future in connection with this matter the Committee therefore consider may also be dealt with by the Central Organization with, if necessary, the assistance of the Carlsruhe Instructional and Experimental Works in regard to any investigations of heating and cooking apparatus. The newly-formed Committee on the Working of Gas-Works will also be in a position to handle this in conjunction with other industrial questions which come before them. On this account, it is a question whether the time has not arrived for the dissolution of the Heating Committee.

At a meeting of the Committee held in Berlin in March, it was considered whether the efforts being made by the pottery trade in many towns to construct a closed tiled stove (of Continental type) for the consumption of gas should be supported by the Committee. The opinion of the Committee is that a gas-stove of this type is irrational and unsuitable for continuous heating. On the other hand, they consider it desirable that there should be co-operation of the pottery trade with the makers of gas-stoves and with architects with a view to settling standards or rules for the insertion of gas-heating apparatus in closed tiled stoves or tiled hearths so as to supplement heating from central plant or from stoves. It was decided to ascertain the views of gas-stove makers and of the pottery trade in regard to this matter.

The Committee are clearly of opinion that the general introduction of gas heating would not improve the load curve of gas-works, but would make it worse, and would put more unfavourable strain on the distributing system than it bears at present. Also gas heating, if introduced on a large scale, would prejudice the sale of coke by gas-works. The chief burden of heating should be placed on coke, and gas will then supplement the central heating and in special cases give valuable service otherwise. The pottery industry should be advised to discontinue its efforts to construct a closed tiled stove for gas heating, because, apart from the bad efficiency of such a stove, the large wall surface to be heated only affords opportunity for the deposition of moisture, and the large hollow spaces between the surfaces present an appreciable risk on account of the possible accumulation therein of explosive mixtures of gas and air. On the other hand, it cannot be denied that the gas tiled stove, on account of its artistic merits, especially when it is built in a tiled casing, is being more and more introduced into dwellings provided with central heating. The stove makers and the pottery trade have hitherto worked independently; and consequently the result leaves much to be desired. Suitable standard types of gas-stoves for insertion in the tiled casing should be agreed upon, so that air warmed by the stove, instead of flue gases, should pass through the passages of the tiled casing. The Committee will endeavour to bring about such desirable co-operation between the gas-stove and the pottery trades in the ensuing year. With this object in view, they ask for a grant of £50, as in the previous year.

GAS-METER COMMITTEE.

Two of the objects which the Committee have on their programme were advanced, but not brought to a conclusion. These were the investigation of the durability of artificial membranes in dry gas-meters and the standardization of the external dimensions of gas-meters from different manufacturers. The Committee also considered questions raised from various quarters, and while not reporting on them at present, must not be supposed to be disregarding them.

With reference to artificial membranes for gas-meters, the Committee had in the previous year experimented in conjunction with the Meter Stamping Committee on the manufacture by a special process of membranes for dry gas-meters from cotton and pure linseed oil. After experimental pieces, containing on the average 82 per cent. of linoxin, had been shown to withstand the effects of the stream of gas, large pieces of the material were produced in the Mayence Gas-Meter Factory and used in the manufacture of eighty-five five-light and twenty-five twenty-light gas-meters. Some of these were distributed last June to eleven different gas undertakings, with directions and forms for the observations to be made on them. These directions stated that the meter should be set up where the temperature and gas consumption were fairly uniform, and that a second meter of the same size should be placed after them for control purposes. The anticipation that by the adoption of a uniform method of investigation the results from the different places would show good agreement has, however, not been fulfilled.

The reports received after five to six months' run of the experimental meters showed that almost the whole of them were recording in advance of the control meter, and the surplus shown was often far in excess of the permissible limit of error. This result was the more disconcerting because all the experimental meters had been officially tested and found satisfactory before installation. In one instance, a meter after one month's use was recording 25 per cent. in excess of the gas passed. The reports received from the different works were considered at a meeting of the Committee in March last. The tendency to register fast was prominent throughout; and the five-light meters were, in this respect, worse than the twenty-light meters. It was decided at the meeting that, in order to exclude the effects of uncertain variations in the temperature and rate of passage of the gas, meters with the experimental membrane should be set up in the governor room at two gas-works where their behaviour could be readily observed. These trials are still in progress.

In regard to the membrane, it has been found experimentally that its behaviour in a current of air is different from that in a current of gas. The moisture taken up from the gas seems to cause a shrinkage of the membrane with a consequent fast registration. This shrinkage disappears rapidly if the membrane is exposed to a current of dry air. Experiments showed that meters when tested with air recorded less than when tested immediately before with gas. The sensitiveness to the hygroscopic condition of the gas depends, in the view of the Committee, on the method of weaving the cotton. The Committee are now in communication with weavers, with a view to ascertaining whether every care had been used in the preparation of the membranes; and the unsatisfactory result in the first instance will not deter them from pursuing investigations in this direction. For the rest, the experiments have shown that the use of pure linseed oil after conversion to a high proportion of linoxin is quite appropriate for the preparation of artificial membrane. As, apart from the effect produced by moisture, the membrane has proved in the experimental meter to be pliant, completely gas tight, and free from liability of dissolution of the impregnating material by the gas, the Committee contemplate continuing experiments on a smaller and less costly scale. They extend their thanks to the authorities of the gas-works which have co-operated with them in the trials of the experimental meters.

The Committee also investigated the question of the effect of pressure waves, as now used for the distant lighting of street lamps, on the water in wet gas-meters. Their report states that the introduction of the use of pressure waves has been attended with certain disadvantages, especially in regard to wet gas-meters and gas-fittings in which there is a water seal. Trouble, however, from this cause has been reported actually only from one town,

notwithstanding the numerous cases in which pressure waves are now being used. The rise of pressure is usually 6-10ths above the maximum evening pressure, and extends every night and morning for three to four minutes. The rise is sudden; and therefore it differs from the rise of pressure which is found necessary in many towns to meet the increase of consumption at the hours of maximum output. If, therefore, there are governors or other apparatus with an inadequate seal, there may be an escape of gas through the imposition of the pressure wave. Water may also be expelled from wet meters of old types of construction if the pressure rises to about 26-10ths. Other old wet meters, owing to the expulsion of water from the drum by the pressure wave, may afterwards register slow. The maximum pressure in any part of the distributing system when the pressure wave is applied may, however, in elevated parts of the district, reach 45-10ths or more. The highest points of the district of supply are, however, usually the furthest from the gas-works, and consequently the pressure-wave will have become reduced by the time it reaches them.

The pressure-wave obviously plays a less important part than local conditions in affecting the pressure in distributing systems. The only question to be considered when introducing the pressure-wave system of ignition is whether the height of the water seal in wet gas-meters is adequate for the prevailing pressure, or whether it is desirable to abolish the use of wet meters in the highest parts of the district or where the pressure wave is most intense. Compared with a gas pressure of 36-10ths to 43-10ths, the seal on wet meters is, with meters of old types of construction, from 18-10ths to 32-10ths, according as they increase in size from three to ten lights, and with meters of recent construction from 34-10ths to 47-10ths, according to size. It is obvious that the seal of the old meters is low for ordinary working conditions of pressure, and that there has been some risk in using them hitherto in certain instances. The use of pressure waves has certainly raised the danger limit slightly; but it has not introduced any new danger. In new meters, however, the water seal should be required to be increased to 42-10ths to 48-10ths, which is a condition with which a number of meter works now comply. With the smaller meters, however, this involves giving up the present pattern and adopting the more costly pattern of wet meters used for acetylene. The conversion of old wet meters to a safe pattern cannot be readily effected; and meter makers have informed the Committee that their efforts to devise simple means of overcoming the faults due to the seal have been unsuccessful, and that they suggest that the difficulties arising from the pressure wave with wet meters should be avoided by substituting dry meters for the latter. The Committee, however, are disinclined to share this view.

In concluding their remarks on this subject, the Committee sum up with the following propositions: (1) Existing gas supply appliances, and especially wet meters, must be adapted to the requirements of pressure-wave ignition of street lamps; (2) pressure-waves present no new source of danger, but increase the risk attendant on the existing use of wet meters with unclosed re-filling openings and overflows; (3) new wet meters should have a deep water seal—say, 4 to 5 inches; (4) there is no acceptable method of making old wet gas-meters with shallow water seal safe against exceptional increases of pressure—automatic flaps on the re-filling orifices afford no permanent security; (5) it is more than ever important that the meter-inspecting staff should be careful about screwing-up the meters properly and that unauthorized persons should not interfere with them; (6), governors with seals of volatile liquid should be treated with the same care as wet meters.

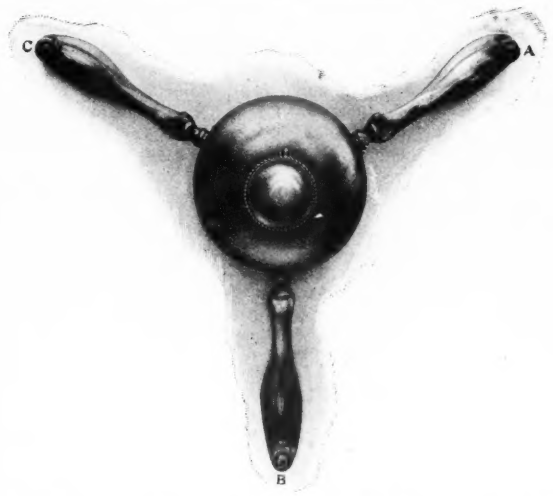
The Committee have also had under consideration the question of the amount of gas which a meter, which has been stamped in the ordinary way by the German authorities entrusted with the duty of stamping gas-meters, will pass at a low rate of flow. The question arose from a representation that a single small incandescent burner consumed much less gas than an old flat-flame burner, and the inference that the smaller consumption might escape registration. The Committee discuss the procedure followed in the examination which precedes stamping, and arrive at the conclusion that it admits of no serious risk of meters which do not register a comparatively small consumption being passed for stamping. Another matter referred to is a suggestion made by a firm of makers of gas-heating apparatus that the time is ripe for the abolition of the method of designating the sizes of meters by the number of "lights." The Committee point out that this nomenclature of the different sized meters is well understood, and is recognized in many enactments, and its abolition would be attended by many difficulties and would possess but few compensating advantages. The Committee express their thanks to the German Standards Committee and their Chief Officer for the attention given to their representations from time to time.

A grant of £30 is asked for to assist the Committee to continue their work this year. The report is signed by the Chairman of the Committee, Herr C. Kohn, of Frankfort-on-the-Maine.

European Gas Company and their Employees.—With reference to the remarks of the Chairman of the European Gas Company (Mr. R. Hesketh Jones) at the recent annual meeting, on the subject of labour troubles, as published in the "JOURNAL" last week, we are asked to state that the staff at Amiens have voluntarily written to the Press in the town to thank the Manager and the Directors not only for an unsolicited increase in their wages some short time since, but also for the recent free grant of a week's holiday every year.

THE "CENTROL" GAS-PENDANT.

IN the designing of gas-fittings, difficulty has generally been experienced in disposing of the taps, which, while being necessary adjuncts to the fittings, often prove obstacles to the carrying out of an artistic device. In the case of a three-light pendant, a tap has hitherto been placed on each arm; and much trouble has arisen in arranging them in convenient positions for turning on and off and at the same time preserving artistic lines. This defect is now remedied by Messrs. Best and Lloyd, who have patented an arrangement for controlling the supply of gas from the centre of the bottom of the pendant, to which they have given the name of "Centrol." It is shown in the accompanying illustration.



The taps are concealed inside the body, and are controlled by the bottom knob, which is seen from the under side, with the indicating peg at "off." A turn of the knob to the right opens the gas-plug of the arm A; the arrow on the knob then pointing direct to the arm—showing that the gas-way is open. A further turn towards the arm B allows gas to pass to this arm; and in a similar way the passage is opened to C. The arrow on the knob always points to the arm last turned on; and the further turning of the knob is arrested by the peg after the third light is ignited. The lights are turned off by moving the control knob in the reverse way; and when all the lights are out, the position of the peg on the knob is as shown in the illustration. The arrangement certainly lends itself to the production of artistic fittings, as evidenced by some which have been brought under our notice, and which show a considerable advance upon the old form of three-light pendant.

SOME "VICTOR" BOILER TESTS.

WITH a natural faith in the good old truth that "seeing is believing," Mr. Thomas Potterton, of Cavendish Works, Balham, S.W., has organized on his premises a series of practical tests of the well-known "Victor" gas-boiler. This is a good idea; and invitations to witness the tests have been largely taken advantage of, particularly by those who are engaged in the distribution departments of gas undertakings. Apart, too, from the actual tests—which may, of course, be reckoned as the main item of attraction—a visit to the works can hardly fail to be of interest; for Mr. Potterton has had a half-century or so of experience in connection with range and hot-water service fitting, and he is thus in a position to impart many useful hints to any who may seek his advice.

The tests referred to, it may be remarked, have been organized in as simple, but at the same time as thorough, a manner as possible, in order to demonstrate in a practical way the results that are obtainable under every-day conditions with "Victor" gas-boilers applied to domestic hot-water supply apparatus. That is to say, the various appliances that are operated upon have all been fitted for testing in a form which is considered the average proportion of circulation and delivery; there being some 16 feet run of delivery pipe from the apparatus to the measuring tank, and a run of about 8 feet of circulating pipes between the boilers and cylinders—the whole being unlagged. Hot-water apparatus constructed on this system, it should be pointed out, consists of a boiler and a cylinder—there being thus provided separate boiler and storage. When interviewing prospective users of "Victor" gas-boilers, gas officials have, of course, in the majority of cases, to deal with existing hot-water installations; and various questions are likely to arise as to the time taken in supplying hot water for scullery and bath purposes, as well as the temperatures at which water can be obtained. In this connection, the tests provide

much useful data. In the testing-room on the works there are to be found models of the different patterns of "Victor" boiler, fitted up with separate storage vessels, to ensure the tests commencing quite cold; while thermometers are provided to record the temperatures of the flue gases and of the water both as leaving the apparatus and as reaching the measuring tank. This permits of the heat losses being ascertained, as well as the actual efficiencies of the boilers.

To deal with a definite series of tests, we may take Wednesday afternoon last, when half-a-dozen practical men visited the works, and witnessed a thorough test of two "Victor" boilers. In fact, they took an active part in the test, for members of the party themselves looked after the reading of the thermometers and the gas-meter. On this occasion, the boilers used were Nos. 18 and 20, of the new pattern "D" series—a model of recent production; and the results of the tests are reproduced here, as it is felt that they should prove of interest to many who may not be able to pay a personal visit to the works. Those who study the figures will note how far they bear out two points on which Mr. Potterton lays much emphasis in connection with his system. These are the low flue temperatures of the boilers and the rapidity with which they supply hot water at a high temperature; the latter, of course, being a matter of considerable importance to householders.

Mr. Potterton draws attention to the fact that, with the separate boiler and storage apparatus, like the "Victor," the heated water is not drawn off from the boiler and circulating pipes, as the cold inlet is connected to the bottom of the storage, which accounts for the temperature of the first bath in the following test of No. 20 Boiler being somewhat less than that of those following, any quantity of which, with this commencing temperature, and using 20 cubic feet of gas, can be had, consisting of 20 gallons of water at 113°. This, he says, shows a running efficiency of 420 B.Th.U.

PARTICULARS OF TESTS.

No. 18 "Victor" Boiler, supplying a 20-Gallon Bath, with a Consumption of 20 Cubic Feet of Gas—Noting also the Temperature at which Hot Water can be Obtained, such as would be required *for Culinary Purposes.*

Water temperature at starting, 71°.
Outside temperature, 79°.
Gas consumption, 34½ cubic feet per hour.

		Flow. Deg. Fahr.		Flue. Deg. Fahr.
Gas lighted—	3.45 p.m.	71	..	—
	3.50 ,,	92	..	128
	3.55 ,,	137	..	144
	4.0 ,,	146	..	154
	4.5 ,,	150	..	156
	4.10 ,,	151	..	161
	4.15 ,,	152	..	164
Gas turned out	4.19½ ,,	156	..	168

20 cubic feet of gas consumed.
20 gallons of water drawn into the measuring tank.
Hottest water, 152°.
The whole in bulk, 110°.

Test of No. 20 "Victor" Boiler (the largest of the "D" Series), showing the Time Required in Supplying a Succession of Baths. This Boiler, having a Standard Consumption of 80 Cubic Feet Per Hour, will Supply Four 20-Gallon Warm Baths Hourly. The Consumption at the Test was at the Rate of 72½ Cubic Feet Per Hour.

Water temperature at starting, 71°.

		Gas Used. Cubic Feet.	Flow. Deg. Fahr.	Flue. Deg. Fahr.	
Gas lighted—	4.30 p.m.		71	—	
	4.35		95	131	
	4.40		135	149	
	4.45		150	160	
	4.46½	20	155	163	
First bath completed.	4.46½ to 4.54	28½ (total) . . .			20 gallons of water drawn. Highest temperature, 150°. Bulk ,, 110°.
Continuing—	4.55		148	168	
	5.0		154	172	
	5.3	40 (total)	158	174	
Second bath completed.	5.3 to 5.10½	48½ (total) . . .			20 gallons of water drawn. Highest temperature, 155°. Bulk ,, 113°.
Continuing—	5.15		154	178	
	5.20	60 (total)	160	180	
Third bath completed.	5.20 to 5.27	68½ (total) . . .			20 gallons of water drawn. Highest temperature, 155°. Bulk ,, 113°.

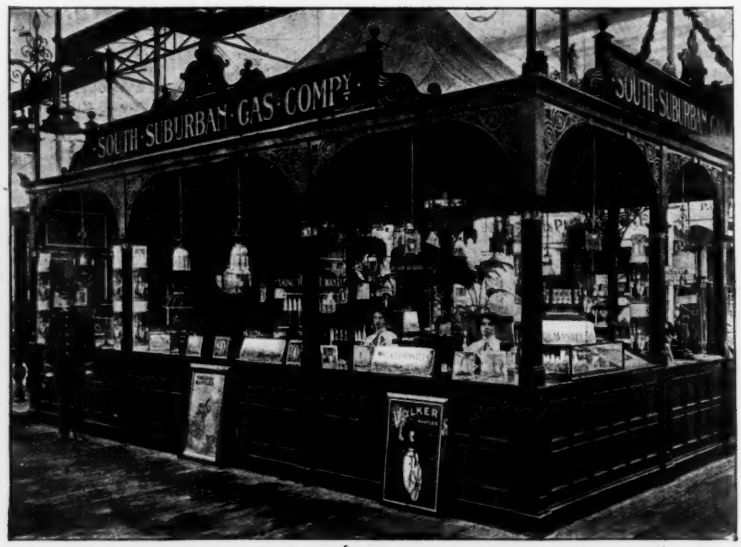
The apparatus having reached its normal running capacity after first heating the boiler and contents, the test was continued with the lower part of the cylinder cut out, leaving 10 gallons in circulation, and the gas kept burning until the thermostat came into operation at 5.45 p.m., when water temperatures were registered as stated below.

	Gas Used.		Flow. Deg. Fahr.		Flue. Deg. Fahr.
5.27 p.m.	..		150	..	180
5.30	..		156	..	180
5.35	..		160	..	182
5.39	..		163	..	183
5.43	..		168	..	184
Gas cut down by thermostat. 5.45	..	90½ (total) ..	168	..	178

At 5.45 the water was run into the measuring tank, the hottest being 166°; 10 gallons in bulk registering 149°, and 20 gallons in bulk 127°.

per cubic foot, which is obtainable from a complete installation such as would ordinarily be used in a flat, allowing for heat losses in circulation and in delivery, though with the cylinder and pipes covered, somewhat higher figures would be recorded, in proportion to the effectiveness of the covering adopted. It must, however, be borne in mind that the heat taken up by the boiler and pipes at the commencement is not wasted, as, upon turning out the gas, the contents immediately circulate into the top of the storage vessel, and become available for use. Finally, it is pointed out that the figures quoted should not be confused with separate tests for boiler efficiency, which would show 90 per cent. of the heat utilized.

VOELKER MANTLE-MAKING AT THE FESTIVAL OF EMPIRE—CRYSTAL PALACE.

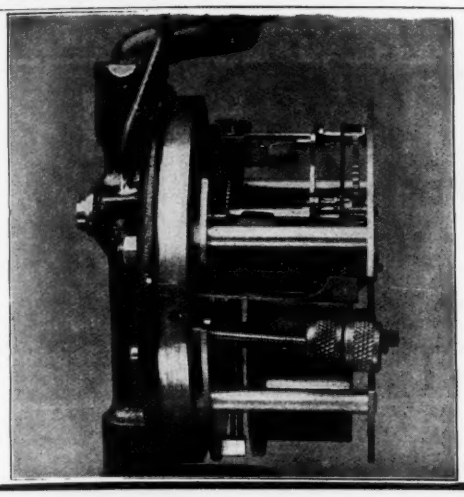


We have pleasure in giving the accompanying illustration as representing the working exhibit of incandescent mantle-making which the Voelker Lighting Corporation, Limited, in conjunction with the South Suburban Gas Company, are showing in the south transept of the Crystal Palace at the Festival of Empire Exhibition. The exhibit includes the knitting of the ramie thread for the production of the mantle-stocking, the shaping of the mantles and the burning of them off—the whole demonstration giving the public a fairly good idea as to how Voelker incandescent mantles are made. The installation is a very compact and interesting one; and if we may judge from the crowds of people surrounding the exhibit when in operation, we should say it proves that the public are keen to learn something as to the actual manufacture of gas-mantles.

The Voelker Lighting Corporation ask us to say that they will be very pleased if any gas engineers visiting the exhibition will inspect the installation.

Reported Vertical Retort Litigation.—We understand that the owners of the Dessau vertical retort patents have issued a writ against the Manchester Corporation in connection with their use of the Glover-West system of continuous carbonization at the Droylsden works. We are further informed that the Corporation are protected by the contract agreement with the makers of the plant.

Association of Consulting Engineers.—Since the draft rules, drawn up by the Provisional Committee, were circulated in December last, a considerable number of meetings have been held to deal with points that have been raised by various engineers. Unfortunately, owing to the large number of interests to be considered and the complexity of the considerations involved, it has been found impossible to call a meeting until after the holidays. Meantime, Mr. Dykes, the Hon. Secretary, would be obliged if all letters were sent to his new address, 11, Victoria Street, S.W.



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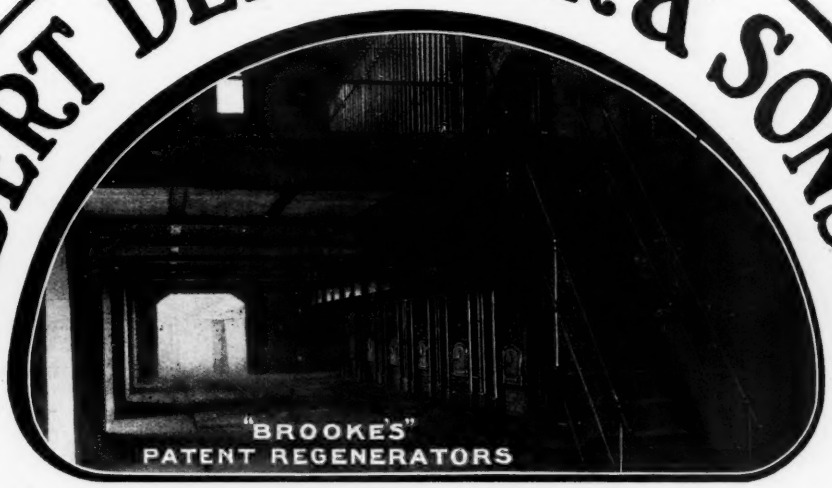

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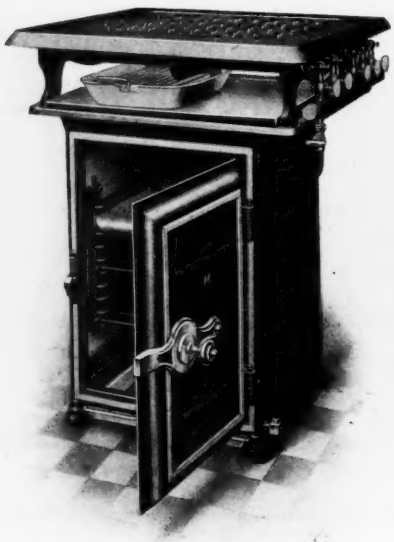

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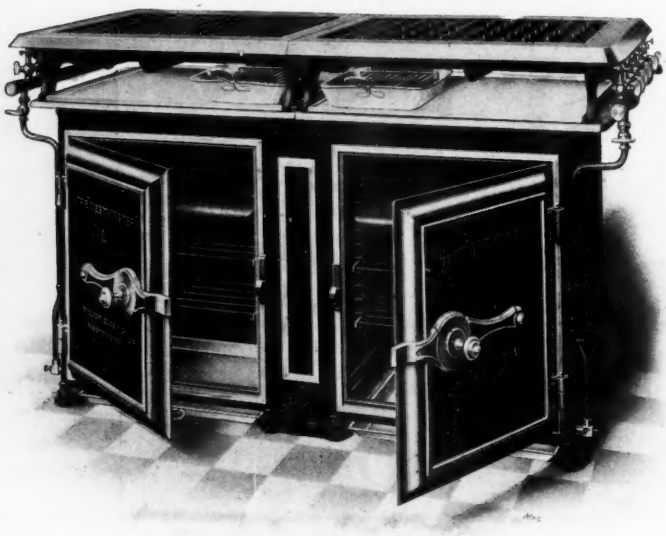

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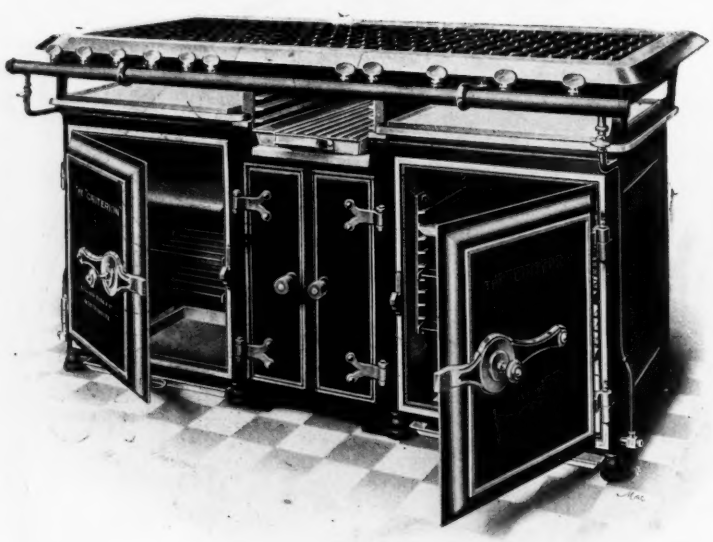

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INVERTED INCANDESCENT GAS LIGHTING.

PROGRESS OF HIGH AND LOW PRESSURE.

At the Spring Meeting of Gas and Electric Engineers of the Province of Brandenburg, held in Berlin, Herr MAX SCHOLZ, a Director of the firm of Ehrich and Graetz, the manufacturers of the well-known "Graetzin" lamps, delivered a lecture dealing with the progress of high and low pressure inverted incandescent gas lighting, of which the following is a full translation.

When in 1905 Professor Drehschmidt first gave the expert testimonial in favour of the inverted incandescent gas lighting system, and published the economical results then obtained with indoor burners, probably not one of the large audience had a conception of the great influence which the inverted system was to exercise at some future time upon the development of the general gas interests. The first inverted indoor burners were followed by the construction of outdoor lamps first of all installed in February, 1906, for public lighting purposes in the Invalidenstrasse at Berlin; and the outdoor lamps for low-pressure gas by those for high-pressure gas, which the City of Berlin was again the first to use for street lighting. It is a well-known fact that the high development of the gas lighting devices must be largely attributed to the eminent assistance rendered to the industry by the Berlin Municipal Gas-Works.

The success of the new gas lighting was not only fully recognized by the gas experts, but the public also proved its high interest, by the always increasing introduction of the inverted lighting for any number of commercial purposes. Whoever may have had any doubts as to the reality of these advantages will certainly have been thoroughly convinced of them by the opposition which the electrical people raised against the new illuminant. The advertisement which the gas industry made for inverted gas lighting by word and deed seems to have created a certain uneasiness in these circles; and they availed themselves of whatever opportunity offered itself to belittle the success obtained by their opponents. The article which Professor Wedding published in "Technische Rundschau," under the heading "Light Sources and the Illumination of Large Premises and Public Localities," must be considered as a new attempt to this effect. Although Herr Himmel, of Tuebingen, in the "JOURNAL OF GAS LIGHTING," has made it a point to go carefully into certain questions that were raised by Professor Wedding, he restricted himself mainly to discussing the possibility of suspending high-candle power lamps from overhead wires. There are, however, several other points which demand a more thorough investigation of the matter.

Although Professor Wedding had to recognize the progress made by gas lighting in consequence of the introduction of the inverted burner, he gave some figures relative to the economy of the inverted burner, which are not correct, and which are in opposition to those obtained by Professor Drehschmidt as early as 1906. Professor Wedding gives the consumption of gas per hefner candle as 1 litre per hour, while Professor Drehschmidt determined it to be about 0·87 litre per hefner candle. Professor Wedding only mentions that the advantages obtained have certainly been increased, without taking any notice, however, of the improved economy. He seems to be unaware of the progress made, especially in the development of low-pressure gas-lamps for outdoor lighting, which caused the City of Berlin to place an order for 500 to 600 candle power Graetzin lamps, with a specific economy of 0·69 litre per hefner, for public lighting purposes. Whenever Professor Wedding makes some concession to our industry, as the one "that the new high-pressure inverted gas-lamps have become a very dangerous competitor to electric arc lamps," it is always followed by a restriction, or by a so-called proof that, in spite of all, electric lighting must be considered as being superior. In one instance, Professor Wedding states that the amount of heat and carbonic acid developed by a 1000-candle power lamp correspouds to the process of breathing of a gathering of 40 to 50 persons. Suppose this calculation to be correct, does the Professor really believe any reception hall or room for 40 to 50 persons to be in existence which does not provide for ventilation? And does not Professor Wedding know that gas lighting causes an increase of ventilation? Can he be absolutely unaware of the experiments made by well-known experts in this direction, such as those made by Professor Vivian B. Lewes, of London? I would also call attention to the report published in 1905 by the Heating Commission of the German Gas and Water Engineering Association, regarding experiments made in 1904 with gas lighting in school rooms and drawing offices, and of which 1400 copies were sent to various municipalities, colleges, universities, &c.

Another publication to be considered is that of Mr. G. Stanley Cooper, regarding the influence of gas and electric light on the purity of atmospheric air; the *résumé* of the article being that the quantity of carbonic acid contained in the air of a room used by men increases much less when gas lighting is employed than when it is lighted by electric lamps. The explanation of this fact, observed so many times, must be found in the air being caused by the hot gas-flame to rise much quicker. The gas-flame thus causes a better air circulation and ensures a superior ventilation of the room by more quickly getting rid of the carbonic acid produced by the people in the hall. All these experiments prove over and over again that the old story of the injurious gas lighting, repeated by Professor Wedding in favour of his "hobby," belongs to the sphere of fairy tales. For indoor lighting, Professor Wedding feels much disturbed by the noise sometimes produced by gas-lamps. He forgets entirely that electric arc lamps also cause disagreeable noises, and that the noise produced by gas-lamps can easily be avoided, or at least be reduced to a minimum by reasonable attendance, which is not possible with electric lamps.

Professor Wedding agrees that for outdoor lighting the new high-candle power inverted gas-lamps must be suffered to take a place alongside of electric arc lighting, and that in future, when electric and gas lamps are in competition with each other, the question will no longer be which one of the two systems gives the highest candle power respecting the better illumination, but which of the two systems requires the least cost for maintenance and attendance. However, not only must the consumption of gas or electrical energy, the cost of new mantles or carbons, and the consumption of burners and globes be taken into consideration, but also the cost of attendance. The sentence pronounced by Professor Wedding is just what gas people want. In earlier days, the arguments of the electrical people were not the same. Then they said: Gas-lamps will never be able to show the same efficiency as electric lamps; now they say that the higher candle power and the better illumination need not be considered—for the reason, probably, that the electrical people must admit having been beaten in this respect. Professor Wedding, however, seems to rely upon the cost of attendance and maintenance being less with electric lamps; and if ever a supposition was erroneous, it is this one. It has not only been for the reason of the better light or the better illumination, but just on account of the lower cost of attendance and maintenance that cities like Paris and London decided to follow the Berlin example by introducing high-pressure gas-lamps—London, even, by substituting them for the existing electric system.

According to my calculation, based upon Berlin conditions, the yearly costs are as follows:

(1) Three-burner 2000-candle power high-pressure gas-lamp with two half-night and one all-night flame—

		Marks.
(*a*) Gas consumption, including cost of compressing	about	260
(*b*) Maintenance and attendance, including mantles required, globes, and repairing work	,,	65
Total		325

Against
One 12-ampere arc lamp, with triplex arc lamp carbons, with two pairs of carbons, of approximately the same efficiency, all-night service—

		Marks.
(*a*) Watt consumption	about	310
(*b*) Attendance and maintenance	,,	265
Total		575
Same arc lamp, with half-night service—		
(*a*) Watt consumption	about	160
(*b*) Attendance and maintenance	,,	155
Total		315

(2) Three-flame 1000-candle power high-pressure gas-lamp with two half-night and one all-night flame—

		Marks.
(*a*) Gas consumption, including cost of compressing	about	130
(*b*) Maintenance and attendance, including mantles required, extra globes, and repairing work	,,	65
Total		195

Against
One 8-ampere T.B. carbon lamp (of about 1100 candles), all-night service—

		Marks.
(*a*) Watt consumption	about	205
(*b*) Attendance and maintenance	,,	265
Total		470
Same arc-lamp, half-night service—		
(*a*) Watt consumption	about	105
(*b*) Attendance and maintenance	,,	155
Total		260

The electrical people not being in the position to reduce the intensity of individual lamps, we must compare two high-pressure gas-lamps of equal efficiency with one half-night electric arc lamp and one all-night electric arc lamp of equal efficiency. This comparison gives the following result:

		Marks.
1.	Two 2000-candle power high-pressure gas-lamps per year	650
	Two 2000 ,, arc lamps ,, ,,	890
2.	Two 1000 ,, high-pressure gas-lamps ,, ,,	390
	Two 1000 ,, arc lamps ,, ,,	730

The electric people will, of course, object by saying that the 12-ampere T.B. electric arc lamps will give more than 2000-candle power, and the 8-ampere arc lamps more than 1000-candle power. Before, therefore, drawing any conclusion out of the above data, I want to reply to these probable objections. According to the "Calendar for Electrical Engineers for 1911," electric arc lamps, with salted carbon and two phase connections, give the following efficiencies:

110 volts at 8 amperes = 1900 Hefner candles J ⊃
,, 12 ,, = 3100 ,, ,, ,, measured with clear glass globe

According to the special prospectus of the German General

Electric Company, dealing with "Intensities of Arc Lamps," some of these lamps show partly better results—viz.:

At 8 amperes = 1890 Hefner candles J ⊃
" 12 " = 3510 " " "

or if measured with opaline globes:

At 8 amperes = 1680 Hefner candles J ⊃
" 12 " = 3120 " " "

the light absorption by opaline globes supposed to be 25 per cent.

These figures refer to carbons giving a yellow-coloured light. In Berlin, however, only carbons producing a white light are used, which, according to the "Calendar for Electrical Engineers for 1911," render about 25 per cent. less light. This 25 per cent. has, therefore, to be deducted from the above figures. We therefore obtain the following result:

8-ampere lamps = 1260 Hefner candles J ⊃
12 " " = 3340 " " "

The candle power of electric arc lamps in the lower hemisphere is therefore higher than that of high-pressure gas-lamps, with which I compare them. If we consider, however, that electric arc lamps have to be suspended much higher than high-pressure gas-lamps, it will be seen that the loss of light is much greater with them than with high-pressure gas-lamps; so that at about 4 ft. 6 in. above the road surface the illumination value obtained with high-pressure gas-lamps is, as a matter of fact, higher than that obtained with the seemingly more efficient electric arc lamps. In the following table, the illumination obtained by both kinds of illuminants is calculated upon the height of suspension used in the City of Berlin.

1000-*Candle Power High-Pressure Gas-Lamp at 5·7 m. Height of Mantle; 8-Ampere Flame Arc Lamp with T.B. Carbons at 8 m. Height of Focus; Illumination 1·5 m. above Road Surface.*

Candle Power.		Illumination.		Distance from Base of Column of the High-Pressure Gas-Lamps.	Distance from Base of Column of the Electric Lamps.
"J" High-Pressure Gas.	"J" Electric Flame Arc Lamps.	"E" High-Pressure Gas.	"E" Electric.		
N.K.	N.K.	Lux.	Lux.	Beneath the lamp.	
0° 780	731	44·6	17·4		
10° 800	788	43·0	17·6	0·75 m	1·17 m
20° 980	900	45·9	17·6	1·5 "	2·34 "
30° 1050	1238	39·0	19·2	2·4 "	3·77 "
40° 1100	1425	28·3	15·3	4·2 "	6·5 "
50° 1080	1500	15·4	8·9	5·0 "	7·7 "
60° 1079	1463	7·3	4·2	7·0 "	11·24 "
70° 1050	1312	3·0	1·6	11 6 "	17·87 "
80° 1000	1068	0·57	0·25	23·5 "	36·4 "
90° 930	900	0	0	..	..

2000-*Candle Power High-Pressure Gas-Lamp, at 5·7 m. Height of Mantle; 12 Ampère Flame Arc Lamp (with Triplex Flame Arc Light Carbons) at 8 and 12 m. Height of Focus; Illumination, 1·5 m. above Road Surface.*

"J" High-Pressure Gas.	"J" Electric Flame Arc Lamps.	"E" High-Pressure Gas.	"E" Electric Flame Arc Lamps 8 m. Height of Focus.	"E" Electric Flame Arc Lamps 12 m. Height of Focus.	Distance from Base of Column High-Pressure Gas.	Distance from Base of Column Flame Arc at 8 m. Height of Focus.	Distance from Base of Column Flame Arc at 12 m. Height of Focus.
N.K.	N.K.	Lux.	Lux.	Lux.			
0° 1400 Beneath the lamp.	1365	79·5	32·2	12·4	Beneath the lamp.		
10° 1550	1470	82·7	32·6	12·6	0·75 m.	1·17 m.	1·89 m.
20° 1800	1680	83·8	32·5	12·5	1·5 "	2·34 "	3·78 "
30° 2100	2213	77·5	33·9	13·0	2·4 "	3·77 "	6·09 "
40° 2150	2625	54·9	27·9	10·7	4·2 "	6·5 "	10·5 "
50° 2170	3255	30·8	19·2	7·4	5·0 "	7·7 "	12·5 "
60° 2130	2730	14·5	7·7	2·9	7·3 "	11·2 "	18·1 "
70° 2100	2438	5·9	2·9	1·1	11·6 "	17·9 "	28·9 "
80° 1975	2100	1·1	0·5	0·2	23·5 "	36 4 "	58·8 "
90° 1881	1680	0	0	0	..	..	..

I think it has been proved by the above calculation that lamps of equal value have been compared. The total cost for attendance and maintenance of a 2000-candle power electric arc lamp is therefore about 30 per cent., and that of a 1000-candle power electric arc lamp about 85 per cent., higher than that of high-pressure gas-lamps of equal values, without considering the well-known advantage that with gas-lamps a thoroughly uniform illumination can be obtained during night-time, while when electric lamps are used, in order to obtain a saving, every second lamp must be extinguished, which, of course, causes dark patches on the road surface. The figures on which my calculation is based are as follows: Gas consumption, 10 pfs. per cubic metre; cost of compressing the gas according to the calculations of Herr Bremer; attendance and maintenance according to practice. For electricity, 12·85 pfs. per kilowatt hour; attendance and maintenance according to the contract with the City of Berlin. These figures are taken from the Budget of the City of Berlin. It is remarkable to note the high cost for attendance and maintenance of electric lamps, which is about four times higher than that for high-pressure gas-lamps.

The table shows clearly the enormous economical superiority of high-pressure gas over electric arc lighting on the base of equal intensity. Anyone who still is sceptical regarding these data, should apply to the Berlin Municipality; and I am fully convinced he would receive full confirmation of the above.

Professor Wedding pretends it to be an advantage that electric arc lamps can be suspended from great heights, which is not possible with gas-lamps, on account of the necessary attendance by workmen, &c. It is well known, however, that what the Professor calls an advantage is just the contrary, as high suspension means high cost of maintenance for electric lamps also, and last, but not least, considerable loss of light.

If Professor Wedding calls the high suspension an advantage, he is making a virtue of necessity. High suspension really is an absolute necessity for electric arc lamps, in consequence of their distributing their light at a much less favourable angle than high-pressure gas-lamps. This is clearly shown in the accompanying diagram showing the light curves of a three-burner high-pressure gas-lamp and of an ordinary electric arc lamp.

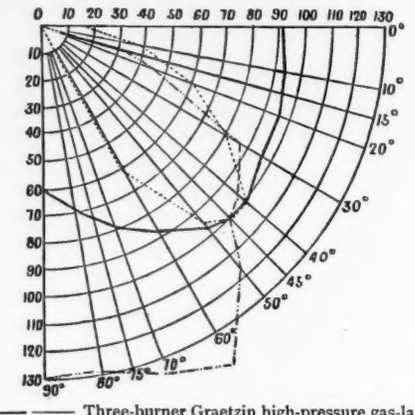


Fig. 1.

High suspension is, furthermore, a necessity in consequence of the considerable glare having proved to be dangerous to the eyes of pedestrians and to the traffic, and which is only caused by the small focus peculiar to electric lamps. The best proof of the above is the fact that the electrical people suspended their lamps in the Friedrichstrasse, Berlin, about 1½ m. lower than before—and this in consequence of the competition of high-pressure gas-lamps in the Königgrätzerstrasse. We have the advantage on our side of the more favourable light distribution and of the large incandescent surface of the mantles, which does not cause any remarkable glare. So we may remain closer to the road surface, and thus avoid the high cost of installation and the greater cost of maintenance and attendance peculiar to electric lamps.

Professor Wedding furthermore discusses the possibility of distance lighting and extinguishing. It is well known that all the high-pressure gas-lamps used in the City of Berlin are lighted from a central station, and extinguished in the same way; and there are appliances in existence allowing the same to be done with ordinary low-pressure gas-lamps. It will, however, be interesting to mention that we have succeeded in installing a distance lighter for high-pressure gas-lamps which enables two mantles to be extinguished in a three-burner lamp and one in a two-burner lamp at about midnight—thus dispensing with special men for the midnight service. This distance lighter enables all the lighting and extinguishing work to be done from a central station. No other men need be sent out, except one or two for controlling the entire system—the number required depending, of course, upon the total lamps in use.

Whatever Professor Wedding may say in the course of his further explanations regarding the balancing of advantages and disadvantages of one or the other system, I am thoroughly convinced that it can only be of advantage to gas interests.

I cannot leave the subject without mentioning that very good solutions of overhead wire suspension for gas-lamps have been arrived at. The following illustration shows the arrangement of high-pressure gas-lamp suspension made by the Municipal Gas-Works above the central promenade in the Greifswalderstrasse, Berlin.

I also want to refer to a circular sent out by a Commission of Municipal Authorities, which contained, among other questions, one asking why a certain city gave perference to some other system of lighting than electricity. The question was answered by a prominent gas-works manager, who stated that he preferred gas lighting to electricity for the following reasons: (1) Greater uniformity of illumination; (2) more favourable light distribution; (3) quieter lighting effect; and (4) more economical working. As soon as the public arrive at the same opinion, the gas industry will be able to brave, in all tranquillity, any attacks of its electric competitors.

I now come to the latest novelty among illuminants—high-candle power lamps for low-pressure gas. The initiative for the

construction of these lamps was given in the advertisement of the City of Berlin for the purchase of 500 lamps of 500-candle power each, which led to the construction of our present 600-candle power low-pressure gas-lamps, of which 500 are in successful use in the City of Berlin. In May of last year, we introduced into the market a three-burner low-pressure lamp of 1000-candle power, which met with the full approval of all interested in gas lighting. Small defects of a constructive nature have since been overcome. All gas undertakings now using our improved 1000-candle power lamp have intimated that they are highly satisfied with it.

The 1000-candle power lamps having given a satisfactory solution of the principle of pre-heating gas and air, we have also introduced a single-burner lamp of about 350-candle power and a two-burner lamp of about 700-candle power, in order to create uniform patterns. The single-burner lamp has another very remarkable advantage. Everyone will have noticed over and over again, when passing outside shops using two-burner or three-burner inverted gas-lamps, instances where one or two mantles of these lamps were broken—only one being in good order. If instead of the three-burner lamp a one-burner lamp of about the same efficiency had been used in the same place, it may be relied upon that the shopkeeper would have taken the necessary care to keep it in good order, as otherwise he would not have any light at all. This is an important argument. Gas-lamps are not so difficult to maintain as our competitors like to pretend; but wherever irregularities are to be noted, they must doubtless be attributed to nothing but carelessness.

The light distribution of 350, 700, and 1000 candle power lamps is shown in fig. 3 It must be acknowledged that the curve is uniform, which again proves our pretension of better light distribution to be correct.

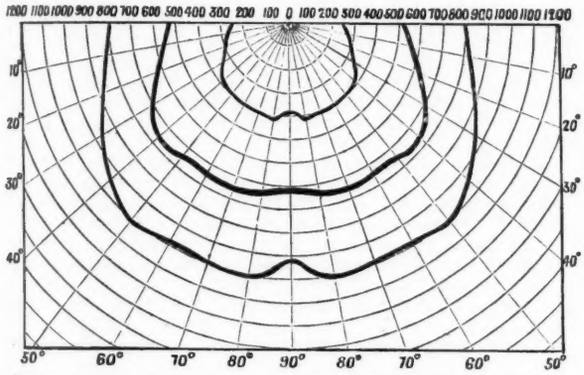


Fig. 3.—Curves from 350, 700, and 1000 Candle Power Graetzin High-Candle Power Low-Pressure Gas-Lamps.

The specific economy of these lamps is about ·61 to ·64 1 per candle power. The exact figures are as follows:—

		Lighting Intensity.	Consumption per Hour.	Economy.
One-burner	300 c.p. lamps .	350 Hefner candles	225 l	0·64
Two-burner	600 c.p. ,, .	650 ,, ,,	400 l	0·62
Three-burner	1000 c.p. ,, .	1012 ,, ,,	620 l	0·61

Although these three patterns form a remarkable step forward toward the absolute perfection of gas illuminants, it must be admitted that they cannot yet be considered to be an absolute equivalent for high-pressure gas or compressed air illuminants for higher efficiencies. We are constantly studying the problem of obtaining higher efficiencies in low-pressure gas, and we have now succeeded in producing a three-burner low-pressure lamp which, according to the curve in fig. 4, will produce about 1650 Hefners with a gas consumption of 975 litres, which corresponds to a specific efficiency of 0·59 litre per Hefner candle. Thus this

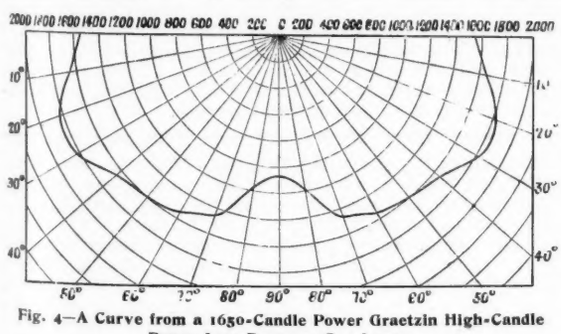


Fig. 4—A Curve from a 1650-Candle Power Graetzin High-Candle Power Low-Pressure Gas-Lamp.

lamp shows the specific efficiency which Professor Wedding, in his article of January last, indicates as normal for high-pressure gas-lamps. Supposing that the average specific efficiency of high-pressure gas or compressed-air lamps to be about 0·5 litre per Hefner candle, it must be acknowledged that, by the construction of this lamp, we have come rather close to the desired result.

I need not specify the many advantages which may be derived from the construction of low-pressure gas-lamps producing the same intensity available through the use of high-pressure gas only, and the enormous economies that would especially be made in the cost of installation.

You see that progress has been made; and I hope to be able shortly to report further progress. It is, however, of the utmost importance to us to be sure of your assistance in the future in the same way as you rendered it in the past; and I firmly believe that you will continue to give it in the interest of a continuous and prosperous development of the gas industry.

STREET LIGHTING BY KEITH LAMPS IN TURIN.

About eighteen months ago, the Turin Gas Company carried out with complete success, and for the first time in Italy, the lighting of the large spinning-mills of Tollegno, in the Regio Parco, with suspended Keith lamps, each of 500-candle power. The gas is compressed to 56 inches water pressure; and the burners are inverted. We learn from a local paper just to hand that the Company followed up this success on Monday evening last week by lighting two of the principal thoroughfares—the Vie Lagrange and Carlo Alberto—on the same system. The plant consists of 55 lamps, of 500-candle power, in the two streets named, and four with lyre suspensions, each of 1500-candle power, on the Piazza Carlo Alberto. The main serving the lamps is rather more than 1¾ miles in length. The lamps are lighted and extinguished automatically by means of pilot-jets inside them. The gas is compressed by a small Keith rotary compressor and a gas-engine; a reserve compressor, with an electric motor, being fixed in a suitable building in the Gas Company's garden in the Via Lagrange. The light produced is stated to be "perfectly fixed, continuous, and silvery, without the least shade;" and the cost is only one-fourth or one-fifth that of the ordinary electric light. The plant was supplied by a Paris firm to the order of the Municipality, by way of experiment for a year; but the commune will only have to bear the expense of the gas—the machinery, main, &c., being provided by the Company.

Gas-Works Bye-Products for Generating Electricity.

Discussing the question of the use of internal combustion engines, working on the Diesel principle, at the meeting of the Incorporated Municipal Electrical Engineers, Mr. H. L. Howard, Electrical Engineer of Barking, referred to the question of the fluctuation of fuel costs, owing to the various influences affecting the oil market. He spoke hopefully on the point, in view of the extension of the sources of supply. Among other factors, bearing on the question, he remarked: "There is the possibility of using the bye-products from gas-works—gas-oil tar, and gas-tar oil. The former is the bye-product from carburetted water-gas plants, where gas oil is used to enrich the gas for illuminating purposes. It has a calorific value of about 16,500 B.Th.U. per lb., and is being extensively used on the Continent. The latter is the bye-product from the distillation of gas tar. The author recently made a careful inspection of some plants using gas-oil tar, including a large double-acting tandem four-cycle engine, and a twin-cylinder horizontal two-cycle engine—the sets working with a 10 per cent. addition of crude petroleum. He was perfectly satisfied as to the practicability of using such fuel; so much so that a 600 B.H.P. engine is now being built to his specification by the Diesel Engine Company, to run on either petroleum residue or gas-oil tar, and will be in commission this autumn."

COKES AND OILS FOR MAKING WATER GAS.

This subject was dealt with by Mr. J. H. Warnick, of Omaha (Neb.), in a paper that he read at the seventh annual meeting of the Iowa District Gas Association. The following are some extracts from it.

In a paper published by Mr. W. H. Fulwieler in 1909, he very ably discussed the constituents and properties to be considered in choosing a good gas coke. Accordingly, we will endeavour to study the materials that represent the backbone of water-gas manufacture as follows: (1) The constituents and properties to be considered in choosing a good gas coke, and the bearing of the properties, when considered, to give a minimum cost and the best machine results. (2) The sources of supply. (3) Oils available for water-gas manufacture.

In choosing a good gas coke, one should bear in mind the following percentages: (1) Of fixed and volatile carbon; (2) of the composition of the ash; (3) of moisture; (4) of sulphur; (5) size of the coke and physical properties with reference to handling.

With regard to the percentage of fixed and volatile carbon, primarily generator fuel is used as a source of carbon; therefore its value depends upon the amount of fixed carbon obtained for a minimum cost, other things being equal. In classifying generator fuel, the ratio of the fixed to the volatile carbon has been used as a basis. The best generator fuel has from 21 to 32 times as much fixed as volatile carbon.

The ash is detrimental in two ways. First of all, it replaces carbon; secondly, it necessitates more frequent cleaning, and consequent loss in capacity on the machine. Theoretically, 1 per cent. of ash is equivalent to 2 per cent. of carbon in waste; and the composition of the ash is very important from the standpoint of operation. The gas maker should aim to get an ash with a high fusing point, for if this is too low, the ash will run down over the grate-bars and form so-called "icicles," hindering the cleaning of the fires, and increasing the manufacturing labour cost. There is also danger of the molten ash coming in contact with the iron parts round the fire-doors and fusing the grate-bars, causing them to melt—thus necessitating more repairs on the machine.

The best analysis of ash shows about equal proportions of silica and alumina, a minimum amount of calcium, and the lowest possible percentage of iron, magnesia, and alkalis. An undesirable ash analysis would show silica to the extent of about 30 per cent., iron above 15 per cent., calcium above 10 per cent., and alkali and magnesia above 3 per cent. Iron is the usual flux appearing in the ash which tends to reduce the fusing-point. A comparison of good, fair, and bad analyses of ash would be as follows:

Constituents.	Good, per Cent.	Fair, per Cent.	Bad, per Cent.
Silica (SiO_2)	54·67	46·23	46·40
Alumina (Al_2O_3)	41·95	31·93	16·45
Iron oxide (FeO)	trace	14·54	18·15
Lime (CaO)	1·82	5·04	11·80
Magnesia (MgO)	1·46	2.26	4·63

Moisture is often a big factor in accounting for the discrepancies between the weight shipped and weights as charged to the generators. Some coke has been received with as high as 12 to 14 per cent. of moisture. After storage for a time, the moisture usually decreases to about 4 per cent. or less when charged to the generators.

Sulphur is detrimental, as it must be removed, and consequently influences the purification results. About one-half of the sulphur is volatile; the other half goes into the gas. The best analysis should not show more than 1·1 per cent.

The size of the coke has an influence on the amount of acid in the gas, and consequently on candle power efficiencies. The quantity of breeze caused by handling, due to the physical properties of the coke, is important, as there is always a certain amount of loss due to it; and this should be reduced to a minimum.

The author then gave a number of analyses showing what might be expected from the various American sources of supply, and pointed out that the best cokes come from the fields of West Virginia and Pennsylvania.

Turning to the oils available for manufacturing water gas, Mr. Warnick said practically all gas oils contain paraffins and benzines. Broadly speaking, the larger the percentage of paraffins, the better the oil for making water gas. Benzines are the oils distilled off from 302° to 572° Fahr.; and paraffins are those distilled from 572° to 700° Fahr. Sulphur is a detriment, and should be a minimum. Having quoted some analyses from a paper by Mr. J. L. F. Cheetham, on "The Ultimate Analysis of United States Gas Oils," the author showed that the paraffins and benzines exist to a more or less extent in all the oils of the country, except those from California. As all the compounds have never been separated out, the actual percentage is not known. The petroleums of the Appalachian field consist chiefly of the paraffin series, with some benzines. The oils of the Ohio and Indiana fields are principally of the paraffin series also, but to a lesser extent than those of the Appalachian field, and contain more of the benzol series. California oil consists chiefly of benzols with no paraffins.

Texas oils contain but little of the paraffin or benzol series. The oils from Kansas differ widely in composition from those of any other section. The very light oils are composed to a great extent of members of the paraffin series; the heavy oils, however, contain but a small percentage of these. The Louisiana field is similar to the Texas field.

In conclusion, the author pointed out that oil from each field must be handled differently in the machines. With Kansas oil, at Omaha they had the best oil efficiencies, carrying about 1330° Fahr. at the base of the superheater, and from 1250° to 1300° Fahr. at the top.

OPERATING A WATER-GAS PLANT.

One of the papers read at the annual meeting of the Pennsylvania Gas Association was on the subject of "The Method and Cost of Operating Water-Gas Plant;" the author being Mr. J. W. Murdock, of Bethlehem (Pa.). He explained that the plant was not equipped with modern appliances, and that the cost of operating it included materials, purification, repairs, and cost of maintenance; also the expense of pumping 60 per cent. of the output to the distributing station (about 1¼ miles away), and a proportionate share of the manager's and the superintendent's salaries. He then gave the following particulars.

The plant consists of one 6-feet and one 5-feet "straight run" water-gas set of the United Gas Improvement Company. The 6-feet machine was rebuilt in 1904, and was then changed from one of the Springer type. We operate these machines on the up and down run principle, as follows: We make three straight runs up and reverse each fourth and make one down run. This is made as follows: We close the valve between the condenser and the wash-box, open the clean-out doors at the bottom of the generator, start the blower, open the blast valve or carburettor between the generator and the superheater, and close the stack-valve. We then blow the fire downwards until the full flame comes out of the clean-out doors, showing that we have a solid bed of fire in the generator. This down-blow usually requires from eight to twelve minutes. The blast is now shut off, stack-valve opened, clean-out doors closed, blast again turned on, and the "straight-run" method resumed. It requires from two to three minutes' blowing-up to get the fire to the proper temperature to admit oil and steam. While this is taking place, the valve between the wash-box and the condenser is opened. This valve is closed at the beginning of the down-blow, to prevent the seal in the wash-box from being broken, and thus forcing "blue" gas into the relief holder.

We have recently changed our method by making each third run a down-blow instead of each fourth run; and we find our results are much better, because our down-blow time is reduced from eight to twelve minutes to from five to ten minutes. We find this method of operating the type of machine in question most economical, because the down-blow fixes the fire thoroughly in the generator, frequent cleaning of which is not necessary—one cleaning of the fire being sufficient for a 12-hour run. The average make during this period is 20,000 cubic feet per hour.

The economy obtained in operating by this method is clearly shown by the following figures, which are the results of working during the year 1910:—

Gas made	78,126,000 cub. ft.
Generator coal used	3,242,884 lbs.
Boiler coal used	1,727,970 ,,
Gas oil used	295,533 gallons.
Average generator coal used per 1000 cubic feet of gas	41·50 lbs.
Average boiler coal used per 1000 cubic feet of gas	22·11 ,,
Average gas oil used per 1000 cubic feet of gas	3·78 gallons.
,, heating value per cubic foot of gas	600 B.Th.U.
,, illuminating power	22 candles.

No barometer or temperature corrections were made in the above figures of the total amount of gas made.

The material we use in purifying is the ordinary iron oxide mixture; and our plant consists of three boxes, 17 ft. by 11 ft. by 3 ft. 6 in. deep. Our method of revivifying *in situ* is a departure from the ordinary practice, and gives us very good results. We first close the gas-inlet valve between the exhauster and the relief holder, open the air-inlet valve between the gas-valve and the exhauster, so as to admit air to the exhauster, and then close the valve on the outlet from the purifying-box, remove the caps from the covers of the boxes, and blow air through by means of the exhauster. The average time required each day for blowing air through the boxes is from two to three hours. This is done at night by the night fireman while no gas is being made; and therefore it does not cause any additional expense.

International Photometrical Congress.—There is a meeting of the Congress being held this week in Zurich—starting to-morrow afternoon at 2 o'clock and continuing the following days. The arrangements for the meeting have been made by M. Th. Vautier, of Lyons. Mr. J. W. Helps is not going to Zurich on the present occasion as representative of the Institution of Gas Engineers; and Dr. Harold G. Colman has been nominated in place of Mr. Helps. Mr. W. J. A. Butterfield (the reader of a paper at the Congress) is acting as substitute for Mr. Charles Carpenter, who is unable to leave England just now. The paper to be submitted by Mr. Butterfield is a joint contribution by himself, Dr. Haldane, F.R.S., and Mr. A. P. Trotter, M.Inst.C.E., entitled "Corrections for the Effects of Atmospheric Conditions on Photometric Flame Standards,"

THE CONTINUOUS PURIFICATION OF GAS IN CLOSED VESSELS.

An American Process.

A recent number of "Progressive Age" contained the following article by Mr. J. G. O'NEILL, the Chief Chemist to the Empire Coke Company, of Geneva (N.Y.), describing a process for the continuous purification of coal gas from hydrogen sulphide in closed vessels.

A successful continuous process for purifying coal gas from hydrogen sulphide in closed vessels, for use in American coal-gas plants, must be simple in operation, economical of labour and material, and easily adapted to our present practice of coal gas manufacture. The following process which I have discovered is remarkably well adapted to our use, not only because it meets all these requirements, but also because practically every coal-gas plant in the United States contains an ammonia concentrator, for making concentrated ammonia liquor, and every plant contains pumps for pumping gas liquor and gas-scrubbers. This apparatus, with the addition of a suitable liquor cooler, constitutes all the machinery required for carrying out my process.

Just above the lime leg of the ordinary continuous ammonia concentrator, we have generally eight or nine washing-rings, or better called fractionation-rings. Their real purpose is to give at the top of the machine a vapour carrying a large percentage of ammonia gas. The weak liquor, after being fed into the top washing-ring, is heated up by the vapours which are caused to bubble through it, and then flows into the next lower ring.

Let us see what chemical change takes place in the liquor in the first ring—in what way the liquor coming from the ring differs from the original gas liquor going into the ring. We find that the outflowing liquor has lost to the ammonia condenser about 20 per cent. of its free ammonia, and about 90 per cent. of its hydrogen sulphide. We now tap this ring near its overflow, so that we can draw off any quantity of liquor desired, and considerably increase the amount of liquor flowing into this ring—drawing off this increase of liquor through the pipe near the overflow without changing the actual amount of liquor being distilled. The liquor flowing from the ring through the pipe which now taps it shows a loss of only about 5 per cent. of ammonia to the condenser, and about 80 per cent. loss of hydrogen sulphide. The liquor from this pipe is now cooled to below 86° Fahr., and is pumped through the first scrubber; taking the place of the weak ammonia liquor wash usually employed. The result of washing the unpurified gas with this treated liquor is as follows. The quantity of gas flowing through the scrubber was 35,000 cubic feet per hour.

Grains Hydrogen Sulphide per 100 Cubic Feet in Crude Gas.	Grains Hydrogen Sulphide per 100 Cubic Feet Left in Gas after Using Treated Wash.
417·4	104·2
422·0	117·0
413·1	104·2
486·5	122·4

On an average, I found 150 grains of hydrogen sulphide eliminated per gallon of liquor wash.

The following is the composition of the weak liquor before and after washing the gas:

	Grains Free Ammonia per Gallon.		Grains Hydrogen Sulphide per Gallon.
Ordinary weak gas liquor before heat treatment	248·0	..	115·9
	195·9	..	96·1
Weak gas liquor after heat treatment	241·1	..	25·4
	189·7	..	21·0
Treated liquor after being used for washing gas	255·5	..	221·9
	218 8	..	178·5

To ascertain the amount of hydrogen sulphide taken out of the crude gas by the ordinary liquor wash, which had not been subjected to treatment, the liquor was analyzed before and after the scrubber; and the following results were obtained (from testing the gas before and after washing scarcely any difference was found):

	Grains Free Ammonia per Gallon of Liquor.		Grains Hydrogen Sulphide per Gallon of Liquor.
Ordinary weak gas liquor to scrubber.	231·8	..	110·9
	209·8	..	93·0
Weak liquor coming from scrubber after washing crude gas	242·4	..	122·7
	225·0	..	119·0

Very little hydrogen sulphide is taken up by the ordinary liquor wash which has not been subjected to heat treatment. By properly regulating the flow of heat-treated liquor to the scrubber, all the hydrogen sulphide can be eliminated from the crude gas. The gas is first washed with this liquor, and then with the regular fresh-water wash.

The very surprising fact of the whole process is that the weak liquor, after being exposed to this treatment and used to scrub the unpurified gas, is now able to take up almost twice as much hydrogen sulphide as it was in its original state.

The most efficient cooler to use is the tubular cooler, made from steel plate and tubes. In this way we can utilize the heat from the hot liquor in warming-up the cold liquor going to the still, and at the same time cool the liquor for use in the gas-scrubber. In addition to this, a cooling-coil, with water spray, will be necessary during the summer weather. It is important that the wash liquor should be cooled to at least 86° Fahr.; and better results are obtained if it is kept below this temperature. If the liquor wash is not cooled to at least 86° Fahr., the wash becomes a detriment, as the reaction is entirely a temperature reaction, and at temperatures above 86° Fahr. the liquor gives off hydrogen sulphide instead of taking it up.

Very little additional steam is required in the ammonia machine, since the extra quantity of liquor acts as a condenser to the ammonia vapours, and a stronger concentrated ammonia liquor is obtained. The additional impurities thrown into the ammonia condenser from purifying the gas have no effect on the crude concentrated ammonia, as they are always saturated with them.

The zone of treatment for the weak liquor may vary with different types of ammonia stills. It may be found necessary with some types to include the two top washing-rings for treatment purposes. These conditions will undoubtedly have to be worked out for each still. The results of the treatment may also vary slightly with the temperature of the liquor feed, volume of feed, and manner of operating the still.

Unfortunately, I have been unable to work with liquor containing more than 4 per cent. of ammonia, but, judging from the way in which the absorption of hydrogen sulphide runs up from a weaker to a stronger solution of ammonia, I believe that, working with the ordinary gas liquor of about 1 per cent. ammonia content, a gallon of liquor will purify 100 cubic feet of gas—the only cost of purifying it being an extremely small quantity of steam. Nowhere in the process is there the least chance for loss of ammonia.

The heated liquor wash also absorbs considerable carbon dioxide from the gas; but, owing to the fact that the gas contains relatively a large amount of carbon dioxide, and the liquor absorbs much less of it than it does of hydrogen sulphide, I have found that the absorption of carbon dioxide from the gas will vary from 10 to 25 per cent. of the total carbon dioxide in the gas.

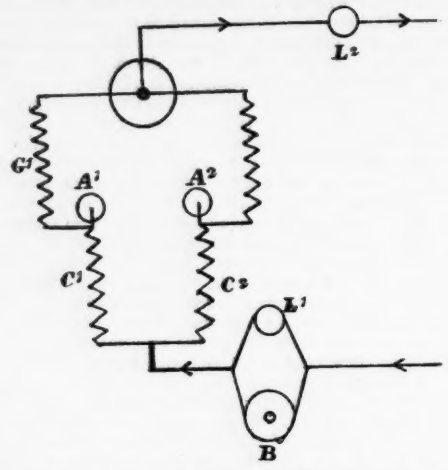
By means of a special apparatus, I have succeeded in obtaining this same liquor wash without being connected in any way with the ammonia still—obtaining the same results as stated above, and regenerating and using over and over again the same liquor. I obtain the hydrogen sulphide as a gas free from ammonia; and it can be ignited and burnt exactly the same as illuminating gas, producing sulphur dioxide. By oxidizing this to sulphuric acid, more than sufficient acid can be made to convert all the ammonia from the gas plant into ammonium sulphate. We have at our disposal the complete raw materials for making sulphate of ammonia, and I believe that the future holds very many interesting processes along this line.

DETECTION OF INFLAMMABLE GAS IN AIR.

At the Meeting of the London Section of the Society of Chemical Industry held at Burlington House on Monday, June 12, two papers were presented dealing with the detection of inflammable gas and vapour in air. Mr. E. Grant Hooper, Chairman of the London Section of the Society, presided. A paper by Mr. H. de Mosenthal, on "Cotton and Nitrated Cotton" was taken first, and occupied a good deal of the time available, so that the two papers referred to were not read in full.

The first of the papers, by Messrs. A. Philip and L. G. Steele, was on "A New Form of Automatic Detector of Inflammable Gases and Vapour." A brief description of the detector was given by Mr. Philip, who showed the instrument in operation. He pointed out that most detectors of inflammable gas or vapour depend on the principle of the Davy lamp; but others depend on the effect of the gas on platinum wire or platinum black. The activity of the platinum, however, diminishes in the course of time. If the atmosphere contains much gas, the wire fuses; or if platinum black is used, its surface becomes fused, and so is rendered inactive. The new apparatus which the authors had arranged embodied a device for guarding against over-heating of the platinum wire used. This device depended on the sensitiveness of a relay. The apparatus was intended to act as an automatic indicator of the presence of inflammable gas or vapour in air, and it gave a warning signal when the proportion of gas or vapour amounted to about one-fourth of that which corresponded with the lower explosive limit of the mixture of the particular gas or vapour and air. The air to be tested was drawn through a pipe from the spot where inflammable gas or vapour was likely to collect by means of a pump, and passed in a regular stream over a platinum wire enclosed in a tube, through which an electric current was passing. If the air contained more than the small proportion named of inflammable gas or vapour, the heating of the wire thereby resulted in the relay making contact, so that a bell was rung and a valve opened by which the stream of air was made to bye-pass the platinum wire until it had cooled, whereupon the original circuit was re-made. In the original circuit, which remained closed so long as the air circulating over the wire contained less than the stated proportion of inflammable gas or vapour, there was a white glow lamp, which remained alight so long as the circuit was unbroken. But

when the platinum wire became heated by inflammable gas or vapour, the original circuit was broken, the white lamp went out, and a red lamp on the fresh circuit was lighted.



The general arrangement of the circuit is shown in the preceding diagram, in which L^1 is a lamp of low resistance, B is a circuit-breaker which has the effect of giving a pulsating effect to the current and the light in the lamps, C^1 and C^2 are platinum coils over the latter of which only the air to be tested is circulated, A^1 and A^2 are the enunciators, G^1 and G^2 are the coils of the relay, and L^2 is a lamp for altering the voltage as required according to the voltage of the electric supply with which the apparatus is connected. The details of the relay by the action of which the current was transferred from the white to the red lamp and the valves on the air circulation changed and the signal bell rung, were shown in a second diagram, which, with some other explanatory diagrams, was like the first thrown upon the screen. The air circuits are not shown, but are arranged so that the coil C^2 is kept from contact with the outer air by means of a glass tube; while the air to be tested bye-passes it as soon as the coil becomes heated to the extent necessary to give the indication of the presence of inflammable gas. As soon as the wire has cooled again, the air to be tested is once more circulated over it, and the warning is repeated. Thus the apparatus continues to give intermittent signals of the presence of inflammable gas or air until the accumulation has been removed by pumping out or better ventilation.

The authors said the apparatus as arranged was not so sensitive to small proportions of inflammable gas or vapour as the flame cap of the Clowes detector, which consists of a small safety lamp consuming hydrogen from a high-pressure cylinder; but by the use of a sensitive differential galvanometer the apparatus could be rendered as sensitive as the flame cap detector. The apparatus had been installed in petroleum-carrying vessels belonging to the Admiralty at Portsmouth, and had given complete satisfaction. It was fitted permanently to such ships, and once installed worked satisfactorily, though in the first instance the arrangements had to be modified to suit the voltage of current available, and the circulating pump, &c. On this account, the authors, had had considerable difficulty in arranging the demonstration apparatus in the lecture hall at Burlington House; but ultimately they had succeeded in demonstrating there the working of the apparatus on a mixture of air with small proportions of coal gas.

The second of the papers was on "Methods of Testing Inflammable Gas and Vapour Detectors," by Messrs. A. Philip and Stenhouse; and a brief *résumé* of its contents was given by the latter gentleman. He said the paper described different ways of making inflammable mixtures and of detecting them. The methods of detection comprised those depending on special forms of safety lamps and those relying on the catalytic action of platinum or palladium. It was essential that, during each experiment for testing the efficiency of different detectors, the composition of the air should remain constant. The detectors might be tested by either of two methods, the first of which might be termed testing in static mixtures. According to this method, a measured volume of inflammable gas or vapour was introduced into the air and was mixed with it by some stirring device. The apparatus was then introduced through a suitable door, and the composition of the mixture was ascertained afresh. This method had been thoroughly worked out by Dr. Clowes, who had used it in connection with his hydrogen-flame detector. The objections to it were that the preparation of the atmosphere to be used occupied considerable time, and that the atmosphere was subject to changes in composition—momentarily, while the apparatus was being introduced into it, and afterwards continuously, owing to the consumption of oxygen by the lamp flame. The second method of testing detectors was termed by the authors the kinetic method. According to it a uniform stream of the mixture of air and gas was passed by means of a pump through a chamber in which the detector was placed. The mixture of air with inflammable gas or vapour on which the tests were to be made could be either: (1) Air and coal gas taken from the ordinary supply; (2) air and hydrogen prepared electrolytically; (3) dry air saturated with a volatile organic liquid at a fixed temperature; (4) a store of mixed gas and air contained in a gasholder; (5) gas withdrawn from a high-pressure cylinder. The methods of making these mixtures for testing detectors were dealt with fully in the paper, as were also those of working out the proportion of inflammable gas in the mixture made. The uses of such mixtures were mainly twofold—first, for the purpose of demonstration to miners and others of the effect of different proportions of gas on the flame-cap of lamps; and, secondly, for comparing the efficiency of different forms of safety lamps.

The two papers were discussed together.

Sir Boverton Redwood said he attended about a year ago at Portsmouth at the Admiralty test of the apparatus described by Messrs. Philip and Steele. He could bear testimony to the value of their invention for showing the presence of the proportion of petroleum vapour which would produce a combustible atmosphere, and consequently of any proportion which would give an explosive atmosphere. He did not wish to institute a comparison between the apparatus and the hydrogen-flame cap test which had been described by him many years ago, and had been used continuously by his brother and others in testing the air of petroleum tanks. In the use of this apparatus, samples were collected from the tanks and examined. The apparatus was not, at least in the first instance, taken into the tanks themselves.

Admiral Little remarked that there were a large number of sources of inflammable gas. At first the Admiralty had only to consider the question of gas evolved from coal in bunkers; but later they had to consider the larger question of the inflammable gas from the oils used as fuels. It was a question as to what extent the Davy lamp could be safely used by stokers and others who were unaccustomed to interpreting its indications. Sometimes they only expected to find carbonic acid in the air of a tank, and looked for it in the lower part; but meantime an explosion resulted from an accumulation of inflammable gas in the upper part of the tank. If there were any fault with the apparatus devised by Messrs. Philip and Steele, it was that it was too sensitive for ordinary use. To his mind, it indicated too small a proportion of inflammable gas; and hence its indications would be apt to be ignored. Where a vessel was divided into a few compartments only, it was undoubtedly good. When, however, there were many compartments, its application seemed to present several difficulties; and he thought there was wide scope for an improved portable device.

Another speaker inquired if the failure in course of time of the catalytic action of platinum did not render the apparatus of Messrs. Philip and Steele unreliable.

Mr. W. J. A. Butterfield said he did not know if the authors in their papers had drawn attention to the remarkable improvement effected within the last twelve months in the sensitiveness of the safety lamp, as a detector of inflammable gas, by Sir Henry Cunyngham and Professor Cadman. It consisted in inserting at intervals in the flame an asbestos comb impregnated with a sodium salt, the effect of which was to render the flame-cap much more readily visible. By this means smaller proportions of inflammable gas could be detected with certainty, and variations in the proportions observed; so that the safety lamp was applicable sa a reliable detector over a much wider range of inflammable mixtures than formerly. Moreover, the flame-cap of the sodium-impregnated flame could be observed by persons with defective eyesight who were incapable of observing the ordinary flame-cap. The new apparatus had all the simplicity of the ordinary safety lamp, but, of course, depended on observation. It would not, like the apparatus of Messrs. Philip and Steele, ring a warning bell. It seemed to him that their apparatus was eminently suitable for permanent installations. With regard to the second paper, by Messrs. Philip and Stenhouse, he was not sure that the authors had referred to the simplest of all methods of preparing a mixture in given proportions of an inflammable gas and air, which consisted in gearing together the spindles of two wet gas-meters through one of which the air, and through the other the gas, was passing. The proportions in the mixture could be varied by altering the gearing.

Mr. Philip, replying for himself and his collaborators, said he regretted that he had used Dr. Clowes's name only in connection with the hydrogen-flame detector. He had not intended to ignore Sir Boverton Redwood's work in connection with it. In regard to the platinum coils, their catalytic action did not fail in course of time because they were protected from overheating. The one shown had been in use since the apparatus was first devised. The cost of a coil was, however, only about eighteenpence. He had there a specimen of the Cunyngham-Cadman safety lamp detector, but had not had an opportunity of making comparisons with it. He understood, however, that it gave very good results. The apparatus he and Mr. Steele had devised was, however, when used with a sensitive differential galvanometer, as sensitive as the Clowes-Redwood hydrogen-flame cap detector.

The meeting closed with a vote of thanks to the authors for their papers and demonstration.

Soap water in concrete has been used in Germany, instead of ordinary water, to make reinforced concrete water-tight. A grain elevator, which was exposed to inundation, was built on the Danube; and according to "Beton und Eisen," the gauging water was replaced by a solution of potash soap. The building has stood one inundation well; while another building of the same material, without the soap, did not quite keep out the water.

OIL-GAS SUPPLY IN MEXICO.

In a recent number of "Progressive Age" (New York), there was an illustrated article by Mr. C. D. Lamson, the General Superintendent of the Mexican National Gas Company, describing the plant by which the oil gas is produced for lighting the city of Mexico. As no coal-gas plant is in operation in the Republic and as outside the city the only Company supplying gas is at Merida, in the State of Yucatan, where the Lowe process is used, the following particulars may be of interest.

Had it not been for the discovery of petroleum in the States of Vera Cruz and San Luis Potosi, the gas industry in Mexico could not have attained any degree of importance, owing to the high cost of gas coal and the limited demand for residuals. But the apparently inexhaustible deposits of petroleum in the Ebano and Huasteca fields uncovered by Messrs. Doheny, Canfield, and Bridge, of Los Angeles, California, who acquired large tracts of oil land, and connected them with 60 miles of 8-inch pipe-line with five pumping-stations, all of a proved capacity for delivering 31,000 barrels per day of 20° petroleum at the port of Tampico, led to the organization by them of the Mexican National Gas Company for the purpose of building plants and furnishing gas in the Republic. A concession was obtained from the Government providing for the free entry of all materials used in the construction of the works and distributing plant built by the Company in any part of the Republic, and relieving them of all taxes, with certain exceptions, for ten years from the date on which the concession was granted. The Company immediately proceeded with their plans for constructing plant in the City of Mexico; commenced its erection in September, 1909; and on June 1, 1910, turned gas on the city with 22 miles of mains laid and 1400 services connected.

The works are situated in a suburb of Mexico, three miles from the business centre of the city. The site is seven acres in extent; and about half of it is occupied by the buildings and plant. A branch of the Mexican Central Railway passes directly through the property, and a private siding runs along the entire extent of the works; thereby affording excellent facilities for the prompt and economical handling of freight and tank-cars. Ample drainage is provided; so that even during the torrential summer rains all parts of the works are free from surface water. An artesian well, about 500 feet deep, gives a good supply of pure water; and its natural flow may be increased by using the air-lift with which the well is equipped. The water raised is collected in a reinforced concrete reservoir, which has a capacity of upwards of 300,000 gallons; thus ensuring at all times an abundant supply for condensing, scrubbing, and fire purposes. From the reservoir or from the well direct an overhead steel storage tank of 68,000 gallons capacity is supplied.

The oil used in the manufacture of gas comes from the now famous Huasteca oil-fields. It averages about 20° Beaumé, and is brought direct to the plant in tank-cars, from which it is pumped into the storage-tank by two outside plunger type pumps, which, when working together, will discharge the contents of a 300-barrel tank-car in from 45 to 50 minutes. The tank is built of steel, overground, and will hold 304,500 gallons of oil.

The gas-generators are two in number, each having an actual capacity of approximately 40,000 cubic feet per hour. Each consists of an upper and a lower vaporizing chamber and a fixing chamber; the latter being a vertical cylindrical shell into which the vaporizing chambers are built, but at right angles thereto. In starting-up or blasting, the oil, previously heated to 150° Fahr. (which temperature is maintained with but slight variations during the entire process of generating and blasting), is fed through the burners in the front of the generators, and the necessary air is supplied by direct-connected steam-turbine driven blowers. After the blast is off and gas-making begins, steam alone is admitted to the lower chamber, and oil is injected into the upper one. Both oil and steam enter in finely atomized sprays, which are regulated by the use of needle valves and a specially constructed atomizer. The resultant gases are finally brought together in the fixing chamber, and go off as a fixed illuminating gas.

Leaving the generator, the off-take nozzle, which is in combination with the stack-valve, leads off to a horizontal leader, where the flow of gas is divided up through five dip-pipes, and passed into the primary wash-box or seal, where the lampblack and tar are separated from it. The secondary wash-box is practically a duplicate of the first, so far as construction is concerned, though its functions are somewhat different. Both of these boxes or seals are constructed much after the fashion of the hydraulic main used with ordinary retort-benches; being equipped with the customary dip-pipes, diaphragms, and tar off-takes. Some difference occurs in the water feed, which in this instance is had through the dip-pipes following the flow of gas, but sprayed under pressure by a conical shaped spreader in such a manner that all the inner surfaces of the dip-pipes are subjected to a constant scouring process through the impact of the water thereon. After passing through the secondary wash-box, the gas is taken up by a steam-jet exhauster regulated to hold the pressure at its inlet at even gauge to 5-10ths vacuum, according to the period of the "run."

The gas is then delivered to the first scrubber, which is of the tower type, 14 feet in diameter and 30 feet high. The trays are of wood, and are set with the slats at right angles to one another. The intervening sections between the tray courses are filled with bright scrap tin, rolled up in the shape of sponges, so that a great area of wetted surface is presented to the gas in its passage through. The water used in this scrubber is that which has been previously used in the seals, and is employed because of its effectiveness in ridding the gas absolutely of its naphthalene content. From the first scrubber the gas passes into the second one, which is a counterpart of it, and which is similarly filled and operated, except that cold fresh water is used. From the second scrubber the gas goes directly into the relief holder, which is of 75,000 cubic feet capacity, in a steel tank.

The exhausters are two in number, each having a capacity of 112,000 cubic feet per hour. They are steam-driven; and their speed is governed entirely by the quantity of the gas in the relief holder. From the exhausters the gas is passed into the purifiers, five in number, set in two groups; the first two vessels being 32 ft. by 14 ft., with reversing gear and top and bottom regulating valves for adjusting the flow of gas. These two boxes are used to remove the sulphuretted hydrogen, and are charged with oxide of iron. The three remaining vessels are filled with lime.

From the purifiers the gas passes through a rotary station meter, having a maximum capacity of 85,000 cubic feet per hour, into the holder—a three-lift one of 500,000 cubic feet capacity, and built in a steel tank. From the holder the gas is boosted into the city by two single steam-actuated compressors, through three compression tanks having a combined free air capacity of 1200 cubic feet. The lines leading from these tanks are of wrought-iron pipe, 6 inches diameter, and diverge, after entering the city limits, to the various district governors, where the pressure is reduced to a uniform 3-inch head of water.

Despite the fact that labour is extremely cheap, a liberal number of mechanical appliances have been adopted. Wherever possible, compressed air has been employed for operating the valves and other devices. This air is delivered by a steam-actuated compressor having a capacity of 10,000 cubic feet per hour. The air receiver has a capacity of 54 cubic feet of free air, and is equipped with an unloading device adjustable to any desired pressure within the limits of the compressor. As operated at present, 50 lbs. pressure suffices for all the demands. To avoid the danger of rupture, all the piping round the works is provided with adjustable hangers and supports fitted with spiral springs to automatically take up any shock that might occur. Expansion joints on all lines are also freely used, and every known source of danger is either entirely eliminated or the emergency provided for.

By Dec. 31, 1910, 41 miles of street mains were laid and in service, of which 23 miles are 4-inch, 14 miles 6-inch, 1½ miles 8-inch, 1½ miles 10-inch, and 1 mile 12-inch. The low-pressure mains are of cast iron, well coated on the outside with asphalt paint, and laid with lead joints. Under street railway crossings, and extending about 10 yards each side of the track, the pipe is boxed, and the latter filled with hot asphalt. The system of gas distribution is divided into four districts, embracing the business centre of the city and three residential sections, each of the latter being supplied from the high-pressure lines through a double district regulator. The business section, however, through which a 12-inch low-pressure line extends one mile east and west, is supplied through two double district regulators. This arrangement gives absolute pressure control, and permits isolation of any district without disturbing the service.

Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. Henry Rayner) that the accounts of the Company for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 14s. 8d. per cent. per annum, carrying forward to the next account the sum of £699,350 1s. 7d. The dividend for the June half of last year was at the rate of £4 13s. 4d. per cent. per annum; while the carry-forward (including a balance of £32,746 taken over from the West Ham Gas Company on Jan. 1, 1910) was £542,370.

Gas Lighting and Ventilation.—One of the "Notes for Gas Users" in the "Ironmonger" for the 15th inst. is on this subject. The writer calls attention to an article in a recent number of the "Revue Industrielle," giving an account of some experiments carried out in a large room when lighted first by gas and afterwards by electricity. The room had one door, two windows, and a couple of ventilator gratings. The lights employed for the experiment were a Tantalum lamp and an upright incandescent gas-burner of the same lighting power, occupying the same positions in the two separate experiments. The experimenters remained in the room, and took precautions in order that the two experiments should be conducted under comparable conditions. The result was that the percentage of carbon dioxide increased from 0·064 to 0·218 in three hours when electric light was employed, and from 0·071 to 0·203 for the same time when gaslight was substituted. The two increases were 0·154 and 0·132 respectively. The writer of the "Notes" remarks that, "seeing that the electric light could not have generated any carbon dioxide, the increase must have been due to the persons in the room. But it certainly looks as if the gas behaved better as a ventilating agent."

HIGH-PRESSURE GAS PLANT WITH MEDIUM MAIN PRESSURE.

At the Annual Meeting of the Southern Gas Association, held at Montgomery (Ala.) a short time ago, a paper on "High-Pressure Gas Plant with Medium Pressure on the Mains" was read by Mr. F. H. Sawyer, of New Bern (N.C.). It contained a description of the plant erected last year at Goldsboro (N.C.), of which the following are some particulars.

When considering the erection of the plant and the laying of the mains (no gas plant having previously been established), seeing that a considerable mileage of pipe would be required to cover the town, it was thought that medium-pressure plant would be the best. This would be specially advantageous, as it would be possible to reach sparsely-built sections of the town with small wrought-iron mains; thereby causing the supply to be available to practically all the inhabitants requiring gas. It was also felt that the consumer could have a service that would be almost perfect; for most managers have had to contend with complaints of want of pressure on low-pressure systems at points where extensions were made with pipes that soon proved too small.

There are in Goldsboro nine miles of mains running in size from 1¼ inches up to 3 inches, all of wrought steel; the principal or main trunk line being 3-inch, and all lateral lines of the small sizes. The mains are laid in the roadway, 30 inches from the kerb and 37 inches deep. No attention was paid to grading these lines beyond following the kerb as established by the City Engineer. A Dresser coupling, or expansion joint, was placed at each 500 feet. Valves were put in at certain points on the main system, for cutting off any section for repairs, &c. They are in brick manholes, so that they can be easily and quickly reached. The mains were all tested to 45 lbs. pressure immediately after being laid. Practically all the services are 1½-inch, and are of galvanized iron. Individual regulators are placed on each service; reducing the pressure from pounds to inches.

At the works the gas is dealt with as follows: From the water-gas set it goes direct to the holder; thence it is drawn by a compressor through the purifying boxes into a reservoir; then through the compressor and into two compression-tanks. The pressure carried in these tanks fluctuates between 7½ lbs. and 35 lbs. A governor placed on the outlet connections of the tanks reduces the pressure to 5 lbs.; this being the regular pressure carried on the mains. The tanks are located between the retort-house and the holder. They are 8 feet diameter and 36 feet long. Practically all the condensation from the gas takes place in the tanks; drain-cocks being placed on the bottom of each for its release. No drips are used on the whole of the main system, and no evidence of water or oil has been seen.

The compressor is run during the day while gas is being made (the extra coal used for steam for this purpose being very small). Afterwards it is run only when the pressure in the tanks drops to 7½ lbs. The two or three times that the compressor has to be run during the early morning and evening necessitates the consumption of about 170 lbs. of coal for the boiler each time. Two men are required to run the plant. The gas maker comes on duty at 6 a.m. and remains until 6 p.m. The helper is on duty from 12 noon till 12 midnight; and the gas is made in the afternoon, when both men are at the plant.

INTERNATIONAL CONGRESS ON CARBIDE AND ACETYLENE.

The Sixth International Congress on Carbide and Acetylene was held at Vienna on May 11 to 13. It was attended by representatives of Austria, Belgium, England, France, Germany, Holland, Hungary, Italy, Norway, Russia, Spain, Sweden, Switzerland, and the United States of America. The total number present on the opening day was estimated at not less than 250. The following summary of the proceedings is taken from a more detailed report in "Carbid und Acetylen."

The proceedings were opened on the morning of the 11th ult. by His Excellency Dr. Wilhelm Exner, the Honorary President of the Congress, in a speech delivered partly in German and partly in French, in which he referred to the importance of the successive International Congresses on Acetylene. Councillor Haas, of the Austrian Office of Public Works, expressed welcome to the delegates on behalf of the Austrian Government; and a similar welcome was expressed by representatives of the Hungarian and Croatian State Authorities. The technical procedings opened under the presidency of Dr. Hugo Koller, of Vienna. In an inaugural address, he traced the development of the carbide and acetylene industries, and referred to their great economical importance. There were then elected as Vice-Presidents of the Congress, Herr Knappich, of Augsburg, M. Gandillon, of Geneva, Dr. Schuhmacher-Kopp, of Lucerne, M. de Seynes, of Paris, and Dr. Michaelis, of Berlin. The first paper presented was by Herr Kautny, of Cologne, entitled "The Position and Development of Acetylene Lighting and of the Autogenous Soldering Industry in Germany." The author deprecated the tendency, which he said manufacturers of acetylene plant displayed at the present time, to neglect acetylene lighting altogether in favour of welding apparatus. There was, however, no question that the greatest field for development at the present time was in the application of acetylene welding to new branches of industry. The reading of the next paper on the list, by Dr. Caro, of Berlin, on "The Lime-Nitrogen Industry," unfortunately had to be postponed, as Dr. Caro was prevented from attending the Congress. M. de Seynes, the President of the French Acetylene Association, then gave an interesting paper on "The Importance of Lime-Nitrogen in Agriculture, and the Practical Results of its Application."

A trade exhibition of carbide and acetylene, for which accommodation had been provided in the Technological and Industrial Museum, was then formally opened, and inspected by the members. The exhibits were of an instructive character for those not engaged in the acetylene industry; but to the latter there did not appear to be much of very special novelty. Nevertheless, the impression created by the exhibition as a whole was favourable. In the afternoon, Herr Knappich, of Augsburg, read a paper on "Acetylene Central Works for the Lighting of Small Towns and Communities." He pointed out that, notwithstanding the competition of coal gas and electricity, there were at the present time in Germany alone 155 central acetylene works, and that the places supplied from them varied in size up to a population of 23,000. In view of the very active propaganda instituted in favour of cross country supplies of electricity, it was imperatively necessary that authorities should be warned of the injury which frequently resulted from the establishment of such central electricity works. Herr Dezsenyi, of Buda-Pesth, then read a paper on "The Use of Acetylene in Mining," which he demonstrated by reference to a number of models. Herre Dalén, of Stockholm, was to have presented a paper on "The Use of Acetylene for Marine Lighting," but unfortunately he was unable to be present at the Congress. A demonstration of autogenous acetylene welding concluded the proceedings for the day.

The second day's proceedings opened with a paper by Herr Immanuel Friedmann, of Vienna, on "Advances in the Use of Dissolved Acetylene." He predicted a great future for dissolved acetylene for portable lamps, if requisite charging stations were established all over the country. Professor F. Sandor, of Agram, then gave an address on "The Development and Present Position of the Acetylene Industry in Croatia and Slavonia." A discussion was next opened by M. Gandillon, of Geneva, on "The Influence of Authorities, Technical Associations, and Private Initiative on the Development of the Acetylene Industry in Different Countries." M. de Seynes, of Paris, pointed out that the great development of the acetylene industry in France was due to the co-operation of private initiative with technical associations, among which he specially named the Office Central de l'Acétylène, which he said had doubled the consumption of carbide. Herr Knappich, of Augsburg, pointed out that, notwithstanding the many official requirements in Germany, the efforts of the German Acetylene Association had been instrumental in putting Germany at the head of carbide-consuming countries. Its consumption of 40,000 tons of carbide per annum was 2000 tons more than that of the United States with Canada. Dr. Levy, of Berlin, pointed out that the initiative of the German acetylene and carbide firms had provided the German Acetylene Association with a fully-equipped laboratory for testing acetylene apparatus, and its tests of plant were recognized and accepted by the Prussian Government.

The afternoon of the second day of the Congress was occupied with visits to a dissolved acetylene works at Möllersdorf, the central acetylene supply works at Gumpoldskirchen, and an oxygen works at the same place. The banquet in connection with the Congress was held on the evening of this day.

On the last day of the Congress, Dr. Michaelis, of Berlin, proposed a resolution to the effect that the congress held the view that the official prescriptions in different countries should be drawn up or altered so that they should not make the regulations in regard to acetylene apparatus for metal working different from those relating to acetylene apparatus for lighting purposes. The intention underlying this resolution was evidently to admit of portable generators being made available for welding in interiors. The moving of this resolution provoked a prolonged and lively discussion; the opponents to it being chiefly the members who are interested in the dissolved acetylene branch of the industry. Ultimately, however, it was decided to defer the consideration of the resolution to the next Congress. Papers were then read as follows: By M. Granjon, of Paris, on "The Position of the Acetylene Welding Industry in France;" by Herr Bernatschek, of Vienna, on "The Furtherance of Autogenous Metal Working in Austria by the State;" by M. Amédéo, of Paris, on "The Use of Acetylene in Autogenous Metal Working;" and by Professor J. Wittal, of Buda-Pesth, on "The Position, Development, and State Furtherance of Autogenous Metal Working in Hungary." The discussion on these papers led to the consideration of the question of organization of instruction in autogenous metal working, and the training of men to do the work. In the afternoon of the last day of the Congress, Dr. R. Linde, of Munich, read a paper on "The Production of Nitrogen for Lime-Nitrogen Manufacture." After describing different methods of producing lime-nitrogen, the author referred to the recovery of nitrogen in oxygen manufacture by the dephlegmation or fractional condensation process. Herr Kassler then read a short paper on "The Chlorine Derivatives of Acetylene." A short discussion on a commercial standard of quality for lime-nitrogen closed the business at the congress.

The next International Congress is to be held at Rome.

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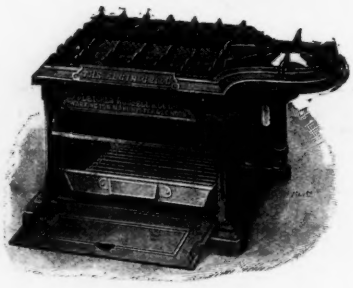

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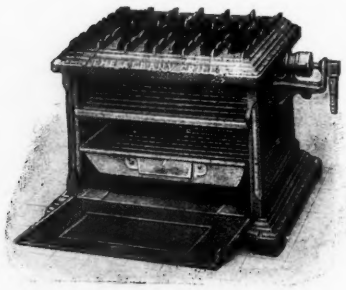

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PROPERTIES OF THE XYLENES.

In the Faraday Lecture recently delivered before the Fellows of the Chemical Society, Professor Theodore W. Richards expounded the theory of the compressibility of atoms, at which he and his coadjutors have been working experimentally during the past decade. The chemical laboratory of Harvard University enjoys a world-wide reputation for accuracy; and instances of the work done there were given by Professor Richards to show the intimate relation of various fundamental properties of substances physical and chemical. Among these instances is one that is of considerable interest to gas engineers, referring as it does to a product of the distillation of coal, and one which has an influence upon the deposition or otherwise of naphthalene in the distributing system.

It is now known, from experience gained and investigations carried on within the gas industry during recent years, that it is equally important to keep the light oils in coal gas "up," as it is to keep the naphthalene content "down." Among these light oils, solvents of naphthalene, the xylenes occupy a leading place. They are three in number, isomeric—that is, of the same percentage composition and the same vapour density, but having certain differences of boiling-point, freezing-point, and density in the liquid state. Their position in the benzene series (C_nH_{2n-6}) is shown by the following sequence: Firstly, benzene (C_6H_6); secondly, toluene (C_7H_8) or methylbenzene ($C_6H_5{\cdot}CH_3$); and thirdly, xylene (C_8H_{10}) or ($CH_3{\cdot}C_6H_4{\cdot}CH_3$, dimethyl benzene). While only one benzene and one toluene are known, three xylenes are known, determined by the relative position in space of the CH_3 groups towards the benzene nucleus and distinguished by the prefixes "ortho," "meta," and "para."

The suitability of such a multiform substance for the testing of Professor Richards' views as to the behaviour of elements and compounds is summed up by him as follows: "Thus as regards two substances otherwise similar, the less volatile one would be less compressible, denser, and possess greater surface tension. These outcomes of the theory correspond with the facts in a majority of cases thus far studied. For example, orthoxylene is denser, less volatile, less compressible, and possesses a greater surface tension, than either metaxylene or paraxylene." Professor Richards and Mr. C. L. Speyers have determined these constants with great care. The substances they employed were unusually pure; the paraxylene freezing at 13·2°C. The details of the experiments are not yet published, but the results are given in the following table:—

Substance Tested.	Boiling-Point in Deg. C.	Density at 20° C., Compared with Water at 4° C.	Surface Tension at 20° C., in Milligrammes per Millimetre.	Compressibility at 20° C. × 10^6.
Orthoxylene . .	144·0	0·8811	3·09	60·0
Metaxylene . .	139·0	0·8658	2·96	63·5
Paraxylene . .	136·2	0·8611	2·92	65·2

The consistency manifested in these results of testing the four properties of the three isomers is a strong recommendation of their general accuracy; and the data thus provided will be of great value to all concerned in chemical questions, and especially to those engaged in gas manufacture and the cognate industries of tar distilling and aniline colour production.

GAS-DRIVEN FIRE-PUMPS.

Most readers of the "JOURNAL" have doubtless heard of, and possibly some have visited, the New York pleasure resort bearing the name of Coney Island. The buildings there have been and are very inflammable; and consequently fire policies were limited to 10 per cent. of the value and a 5 per cent. rate charged. The location is distant from the general fire system of the borough of Brooklyn; and to maintain an adequate number of fire-steamers to cope with the possibilities would have entailed a very heavy expense. Abundance of water was available; but the question of power was important. What was needed was such a solution of this problem as would enable a large amount of power to become available quickly, yet entail little or no expense in the intervals when it was not required. The problem was successfully solved by using gas-engines supplied with ordinary illuminating gas. An account of the installation was given by Mr. J. F. Springer, of New York City, in a recent number of "Progressive Age;" and from it the following particulars are taken.

A large gasholder in the vicinity was available; and suitable connections were made with it. Three Nash gas-engines, of the vertical three-cylinder four-cycle type, were installed. The cylinders are 13¾ inches diameter, with 16-inch stroke. When the engines are run at 260 revolutions per minute, 175 H.P. is developed by each. This is accomplished with gas of a calorific value of only 590 B.Th.U. per cubic foot by using only 17·4 cubic feet per brake-horse-power per hour. The valves of one cylinder in each engine are arranged to permit the use of compressed air to start it. There are two separate compressors, one of which has its own small gas-engine. There are in addition a series of storage-tanks for compressed air, of a capacity equal to starting all the engines twice. It will thus be seen that very adequate provision has been made for starting-up. In fact, the men in charge do not have to exert themselves at all. The compressed air starts the engine forward, operating through one of the three cylinders. The other two cylinders quickly develop power from the gas—indeed, in one or two revolutions. The engine is put into full operation by gas in 20 seconds, and all three engines and the entire plant in about 2½ minutes.

This power equipment drives a very efficient pumping plant, consisting of three triplex double-acting piston pumps, each directly connected to one of the gas-engines, and forming with it a water-handling equipment independent of the other pumps. The pistons are 12 inches diameter with a 14-inch stroke. There is a capacity of 40·3 gallons at each revolution of the three-arm crank-shaft; and as the ordinary speed of this is 38·5 revolutions per minute, there is a pumping capacity of 1551 gallons per minute per pump. Each of the pumps has a bye-pass permitting the discharge to pass into the overflow-pipe. While the engine is getting under way, the bye-pass valve is open; but when full speed is attained, the valve is gradually closed by an electric motor. The valve is opened or closed in 20 seconds; and the electric motor automatically stops when its work is completed. The total capacity of the three pumps is 4650 gallons per minute. The pressure is 150 lbs. per square inch at the pumps. For a hydrant seven-eighths of a mile away, the pressure falls to only 140 lbs. when the full capacity of the plant is employed. The area protected totals about 65 acres. There are numerous hydrants, so distributed that the whole energy of the pumping plant can be concentrated upon any one block of buildings. These hydrants have 2½-inch hose connections, and are joined to the service mains by 8-inch piping. The full capacity of 4650 gallons per minute can be developed with 15 to 20 streams.

Mr. Springer says this pumping plant seems to have been admirably conceived. It is economical, as it is operated only when needed; and the attendance expense is low. It can be started up with great rapidity and with entire certainty. If the city water fails, the Atlantic Ocean can be called upon. The whole plant need not be put into operation if the situation does not require it; and the starting-up of the plant does not depend upon the muscular strength of the persons at the moment in attendance. A great volume of water per minute is available. Further, the streams are very powerful, so that considerable heights can be reached. A pressure of 140 lbs. per square inch is equivalent to that obtainable from an elevated tank or stand-pipe 320 feet high. The high-pressure pumping plant had a severe test in 1907, during a serious conflagration. The total capacity of the plant is, as already stated, 4650 gallons per minute with a pressure of 150 lbs. per square inch at the pumps. The 1907 blaze made demands that were just about equal to the capacity. A considerable number of steamers were summoned to the spot; but it is stated that only a few were really used. The cost for gas for the 16-hour run of the plant amounted to $58.

PHOTOMETER FOR OUTDOOR OR INDOOR USE.

In a recent number of the "Comptes Rendus," a description was given by M. Henri Malosse of a photometer suitable for testing either street or house burners. It consists of two smoked glass prisms and two of ordinary glass united so as to form two plates with parallel sides which can be made to slide horizontally one before the other and in the opposite direction, by means of a rack and pinion. This combination represents an absorbing medium the thickness of which may vary from about zero to a sufficient degree to prevent an observer from seeing letters traced on a blackened glass, and illuminated through transparency by the source of light to be examined.

Displacement of the prisms involves that of a graduated rule in front of an index. The prisms are placed in a box, each of the two opposite large sides of which is perforated with a central opening—one forming an eye-piece, and the other provided with two tubes. One of these tubes is fixed, and furnished at the end screwed on the box with a positive lens of 16 dioptrics; while the second, which can slide in the other, terminates on the lens side in the blackened glass on which the letters are traced. The latter, therefore, represent an object which can be brought into the focal plane of the lens or on either side, so that the observer, whatever may be the state of his ocular refraction, can see the object clearly.

In using the instrument, the operator stands at a certain distance from the lamp containing the source of light, and then, looking at it through the photometer (after having suitably reduced the thickness of the smoked prisms, and moved the tube having the letters on it to the point where the adjustment gives the clearest view of these letters), gradually increases the thickness of the absorbing glass, and finally stops at the point where the luminous power transmitted is too small to make the letters visible. He then reads the division of the scale opposite the index. This gives him, either directly or by the aid of a table previously drawn up for each apparatus, the illuminating power, in carcels, of the source of light under test.

During the six months ended June 30, there were issues of new capital to the amount of £116,205,939, compared with £222,920,323 in the corresponding period of last year. In the amounts named, £31,000 was issued in connection with gas and water supply projects this year, against £70,190 in 1910.

DESTRUCTIVE DISTILLATION OF WASTE WOOD.

At a recent Meeting of the New York Section of the Society of Chemical Industry, a paper on "Utilizing Waste Wood by Destructive Distillation," prepared by Messrs. J. & J. C. Lawrence, was submitted. The text of the paper was given in a recent number of the "Journal" of the Society; and from it the following particulars are taken.

According to the statistics of the United States Forest Service, based on a figure of 65·16 per cent. waste given by Frankforter in the "Journal of Industrial and Engineering Chemistry," there were in 1907 150 million tons of wood wasted, the greater part of which could, by utilization, have been saved. The authors confined themselves to only one phase of the question—that of utilization by destructive distillation; and they limited themselves further by dealing only with those products obtainable from hard woods, principally oak. The immediate products obtained by destructively distilling oak are well known—viz., pyroligneous acid liquor containing acetic acid and methyl alcohol; tars and oils; charcoal; and uncondensed gases. Some of these yield other substances of commercial importance on further treatment. The acid liquor may be neutralized by milk of lime after freeing it from tarry matter; and the alcohol or crude wood spirit is then distilled off. The wood spirit may then be rectified further if deemed necessary. The tars can also be redistilled and the more valuable creosote oils obtained. The gas is (or may be) used for heating the retorts or ovens during a part of the distillation. The charcoal, after cooling, is ready for market without further treatment.

The authors took as an example of commercial utilization the wood wasted in a small lumber mill over a period of a few months, for which they had accurate figures from personal observation. The mill cut 125,000 feet of hardwood lumber. Using Frankforter's figures, they found that there was wasted in stumps, slabs, limbs, &c., wood to the amount of 883,700 lbs. Almost all of this could have been used for distillation, and would have yielded products as follows:—

Tar	30,488 lbs.
Charcoal	274,919 ,,
Alcohol	9,544 ,,
Acetate of lime	42,948 ,,

From statistics furnished by the United States Census Bureau for 1909, these would have the following values:—

Tar, at 8c. per gallon	$250
Charcoal, at 6c. per bushel	825
Alcohol, at 24c. per gallon	1865
Acetate, at 1·5c. per pound	644
Total	$3584

In a small commercial plant of about ten cords capacity per day, this would have taken less than three weeks to work up. These small figures were taken by the authors, contrary to the usual custom of speaking in sums far above ordinary comprehension, to indicate approximately the great field of saving in natural resources which the chemist and the chemical engineer can effect.

As a matter of interest, they submitted (below) an analysis of a sample of the gas taken from one of the distillations, and they called attention to the high calorific value of this gas for a "wood gas."

	Per Cent. Vol.
Heavy hydrocarbons	8·16
Marsh gas	12·32
Carbon dioxide	31·45
Carbon monoxide	35·08
Hydrogen	10·94
Nitrogen	2·05
	100·00

Calorific value . 11,493 B.Th.U. per lb.

SULPHUR QUESTION IN THE UNITED STATES.

We learn from "Progressive Age" that while expert sanitarians and bacteriologists are upsetting some of the orthodox notions about the harmfulness of sewer gas, the chemists have not been idle in settling some matters that are within their province; one of these being the supposed danger from sulphur in illuminating gas. Several states and cities in America have laws to the effect that gas shall not contain more than a certain amount—generally, 20 to 30 grains—of sulphur per 100 cubic feet. A series of experiments reported by Mr. F. E. Gallagher, of Boston, shows that the supposed danger is greatly exaggerated, and that the restrictive laws do not rest on any rational basis of fact. In the air of a gas-lighted room, the sulphur appears as sulphur dioxide; and these experimental results indicate that the quantity of this in gas-lighted rooms is wholly negligible as regards comfort and health. Further experiments bearing upon this problem gave the following results.

1.—In no case, even under the most restricted conditions of ventilation, did the burning of gas give rise to noticeable odours of sulphur gases.

2.—With the doors and windows sealed, and the ventilation restricted as much as possible, the air of the room changed 1·8 times per hour. When the ventilation was rendered favourable for regular living conditions, the rate of change of air was several times greater than the figure just given.

3.—As regards the vitiation of air by carbon dioxide, it was found that one man actively exercising had about the same effect as gas burning at the rate of 5 cubic feet per hour.

4.—Paper on the walls and ceiling only moderately reduced the effectiveness of the plaster in the absorption of sulphur gases.

5.—Sulphur gases formed on the combustion of illuminating gas are removed from the air of rooms in three ways—viz., by the changing air in the ordinary course of ventilation, by condensation along with water vapours on the cold walls and windows, and through absorption by the alkaline constituents of the walls and ceilings.

6.—As the sulphur content of a room increases markedly, the rate of reaction between the plaster and the sulphur gases becomes greater; thereby effecting a proportionally more rapid removal of the sulphur gases.

7.—Calculations of the sulphur dioxide content of the air of rooms from the sulphur introduced by the inflowing gas are wholly unreliable if they fail to take account of the different ways in which sulphur dioxide escapes from a room.

Coal Gas for Train Lighting.

It will be remembered that not long since some special articles appeared in our columns, by a lighting expert connected with one of the railway companies, on the subject of railway carriage lighting by gas. A "Railway Officer" has also now contributed an article to the Engineering Supplement of "The Times" on the same subject; and, in the latter part of the article, he discusses, as did also our contributor, the economy and value of coal gas for this purpose—the incandescent burner having made the use of rich oil gas quite unnecessary. It is admitted that the latter has a higher calorific value and that less is required (say, 0·6 cubic foot per hour as against 0·9 to 1 cubic foot of coal gas); but the difference in price—coal gas at 2s. 6d. to 3s. per 1000 cubic feet as against oil gas at about 10s. or more—leaves room for a very substantial saving which has not been made hitherto by British railways, apparently either through ignorance or the force of tradition. Now, however, they would appear fully alive to the matter, and a change-over may be anticipated shortly. In France, the Etat (late Ouest) Railway has already discarded oil gas for coal gas, and it is stated that the Nord Company are proposing to follow suit. In this country, the trains of the North London and the Isle of Wight Railways are lighted by coal gas; while larger lines, such as the London and North-Western, and the London, Brighton, and South Coast, have had trains fitted and running for some time for experimental purposes. While differences of opinion exist at the present moment in railway circles concerning the desirability of using gas in any form for carriage illumination, it must be admitted that modern incandescent gas lighting, if employed with proper precautions—and particularly if coal gas is used—is trustworthy and satisfactory, besides being economical.

Early Gas-Lighted Railway Tunnel.—The anniversary of the opening of the London and Brighton Railway seventy years ago last Wednesday week was the subject of an interesting article in the Engineering Supplement to "The Times" that day. Those of our readers who have journeyed by rail to the "Queen of Southern Watering-Places" will remember the tunnel they pass through just before reaching Redhill. It comes after a cutting about 100 feet deep, and nearly perpendicular; and these two features of the line were regarded as marvels at the time of the opening. Though it was only rather more than a mile long, in order to alleviate the fears of the passengers the tunnel was "well whitewashed throughout and lighted by gas." This illumination, we are told, "induced a feeling of confidence and cheerfulness," while to the engine-driver it was "of the utmost moment, enabling him to see the road almost as well as in broad day—so well, indeed, that any obstruction existing, which otherwise would not be observed, will by him be perceived and guarded against." The run through the tunnel occupied only about two minutes, so great was the hurry to get out.

Recent Wills.—Major Edward Coleman, formerly of the Honourable Artillery Company, and a Director of the Mitcham and Wimbledon Gas Company, who died on the 9th ult., left estate of the gross value of £123,618, of which the net personalty has been sworn at £110,909. Lord Edward Spencer-Churchill, who was a Director of the City of St. Petersburg New Water-Works Company, Limited, left estate of the gross value of £49,928. Sir Nathan Bodington, LL.D., Vice-Chancellor of the University of Leeds, who died on the 12th of May, aged 62, left estate of the gross value of £6895, of which £5627 is net personalty. The late Mr. W. J. Jenkins left estate of the gross value of £11,930, of which the net personalty has been sworn at £11,845. Mr. James John Frederick Stevens, of Holmhurst, Erith Road, Belvedere, Chairman of the West Kent Gas Company and of the Mitcham and Wimbledon Gas Company, who died on the 14th ult., as recorded in the "JOURNAL," left estate of the gross value of £156,525, of which the net personalty has been sworn at £152,734. Deceased left £10,000 to the Roman Catholic Bishop of Southwark, towards the endowment of St. George's Cathedral, and also his Holmhurst estate at Belvedere, for charitable purposes, such as a home for aged or infirm priests, a training college, or a convalescent home.

REGISTER OF PATENTS.

Automatically Operating Gas-Burners.

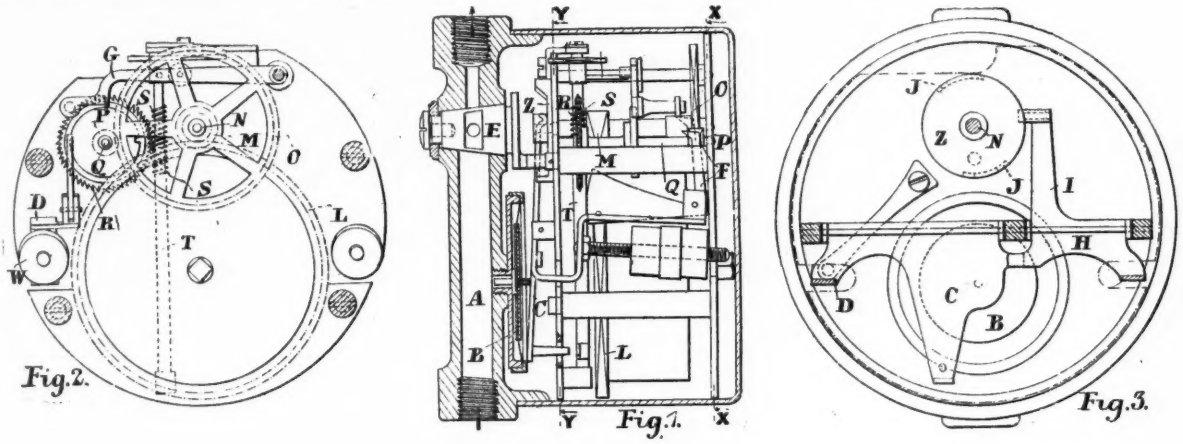
ROBSON, G., of Regent's Park, N.W.

No. 15,741; June 30, 1910.

This invention relates to apparatus, controllable from a single point or station, for automatically operating gas-burners, of the type wherein the movement of an expansible device under the pressure existing in the main controls the gas-cock operating motor through the medium of two overlapping weights, one of which may be rendered inactive when required to vary the load. Apparatus of the class referred to is described in patents No. 7434 of 1909, and No. 14,681 of 1910.

The specifications of these earlier patents describe apparatus in which a diaphragm, by an intentional rise of pressure in the gas-main, expands against a system of weighted levers to unlock or release a clockwork motor, which, in its turn, actuates a gas-valve. This lever mechanism comprises a pair of weighted levers—one being a main lever carrying a pawl for releasing the clockwork motor, and the other being an auxiliary lever normally overlapping and bearing upon the main lever, but adapted to be freed therefrom or rendered inactive by means of a cam, the effect of which is that the apparatus lights at a pressure which is relatively higher than that for extinguishing. When the cycle of operations is completed, both weights are returned to duty—causing the diaphragm to fully contract and bringing the pawl back to its engaging position; so that if the pressure in the gas-main is increased, the diaphragm expands and raises the pawl to release the mechanism for another cycle.

The apparatus thus described—which was adapted to work either with an increase of pressure followed by a subsequent decrease (as in No. 7434 of 1909) or by an increase in pressure only (as in No. 14,681 of 1910)—the range between the unlocking pressure and the actuating pressure in one case and that between the engaging pressure and the actuating pressure in the other case, is adapted to be constant. But it has been found in practice that it may not always be convenient to use apparatus working as described. For instance, in some districts it is undesirable that the pawl should be left in engagement between the time of extinguishing and that of the following ignition. When in practice, owing to the use of gas-stoves, the pressure in the mains is considerably increased during the day for cooking or heating purposes, if the pawl is left in engagement, the rise of pressure might be such that the apparatus would be started when not desired. It is the principal object therefore of the present invention to so adapt the apparatus by means of certain removable and interchangeable parts or devices that it can be quickly and simply adjusted to meet the local conditions prevailing in any particular district where the lighter is to be used; the result being that the device is "rendered very effective and flexible in its capacity for application."



Robson's Automatic Gas-Burner Lighter.

Fig. 1 is a side elevation (partly in section) of an automatic gas lighting and extinguishing apparatus operating by a rise and a subsequent decrease of pressure, for use with devices according to the present invention. Fig. 2 is a transverse section on the line X—X (looking in the direction of the arrow) and showing in detail only those parts necessary. Fig. 3 is a section on the line Y—Y.

To first give a brief general description of the apparatus, and then to describe the application of the invention thereto, it may be mentioned that the gas in the supply main A is adapted to normally press upon the diaphragm B, and when the pressure is raised, the expanding diaphragm (by its centre pin) actuates a two-armed lever C D. The arm C carries a projecting pin, and the end of the arm D carries a pawl F, which, when raised by the diaphragm, raises a lever G, which controls the starting and stopping of a clockwork motor. The arm D also carries an adjustable weight. The motor comprises a barrel K carrying a spur wheel L in mesh with a pinion M on a shaft N. This shaft also carries a spur wheel O in mesh with a pinion P on a shaft Q, which drives a toothed wheel R engaging with a worm S on an escapement shaft T. This shaft, at its upper end, has a projecting pin U adapted to be stopped in its rotational movement by coming into contact with a projection on the lever G, while at its lower end it is fitted with a projection adapted to engage the pin on C. The end of the lever G is broadened, and has a tooth adapted to engage with a notch in a disc mounted on the shaft Q. Thus when the pawl F rises (owing to an increased pressure behind the diaphragm) it will raise the controlling lever G, and unlock the clockwork motor by removing the projection from the path of pin U.

The clockwork motor now commences to work, but is stopped immediately afterwards, owing to the pin engaging the projection on the escapement shaft T. When a succeeding decrease of pressure occurs in the main, the diaphragm recedes, withdraws the pin, and the clockwork motor is free to perform its work. During this operation, the tooth of the lever G rides on the smooth periphery of the disc, and the shaft N, by means of a disc Z thereon carrying a crank pin, actuates the gas-cock E controlling the passage of gas to the burner.

In order that extinguishing may take place at a relatively lower pressure, the lever C has a projection which overlaps a similar projection on a lever H. This lever is fitted with an arm I having a bent end resting against the disc Z. The arrangement is such that, when lighting is to be effected, both weights, by the overlapping parts of the levers C and H, act against the diaphragm, so that their combined pressure has to be overcome in order to effect lighting. When lighting is effected, the consequent movement of the disc Z brings one of two cams J thereon under the end of the arm I, and separates the overlapping parts, whereby what may be called the loose weight V no longer bears against the diaphragm, so that extinguishing is effected against the pressure of what may be called the fixed weight W only.

This apparatus, which works with a rise of pressure and a subsequent decrease of pressure (the cycle described in patent No. 7434 of 1909), may be very easily converted into apparatus working with a rise of pressure only (the cycle described in patent No. 14,681 of 1910) by removing the pin on the arm C and the projection on the shaft T.

In carrying the present invention into effect so that with the apparatus described lighting and extinguishing will be effected at the same pressure, the cam disc Z is replaced by a plain disc whereby the loose weight V will not be periodically prevented from acting on the diaphragm, but that both weights V and W will always act thereon; the pawl being automatically engaged after lighting or extinguishing. For example, No. 2 apparatus is engaged at 30-10ths pressure and operates at 35-10ths.

Preparation of Ammonium Sulphite or Sulphate from Gases.

BURKHEISER, K., of Aachen, Prussia.

No. 15,877; July 2, 1910. Date claimed under International Convention, July 2, 1909.

In the specification of his patent No. 21,763 of 1908,* the inventor explains that by causing the sulphur compounds contained in gas to react, after oxidation, with the ammonia of the gas, ammonium sulphite or sulphate is directly produced; and this, having regard to the subsequent utilization of the gases, is confined in most cases to the separate oxidation of the sulphuretted hydrogen without simultaneously acting upon the other constituents of the gas. Whereas this isolated treatment of the sulphuretted hydrogen by leading the gases over an oxygen-transferring mass can be attained, he proceeds to point out, there is available in some works a natural oxidizing operation which is provided by the combustion of the entire gas containing sulphuretted hydrogen, which combustion is carried out on the spot. In the working of coking plants, for example, where the distillation gas is burnt partly in the furnaces and partly under steam-boilers, sulphurous acid is contained in the waste heat in amount proportioned to the original sulphuretted hydrogen content. Even although the oxidation of the sulphuretted hydrogen by transference of oxygen takes place in a manner which is absolutely without objection, and is, as mentioned, a condition in the manufacture of illuminating gas, special apparatus and a particular working of it are necessary for the purpose.

In the process according to this invention for the preparation of ammonia sulphite or ammonia sulphate, the products of combustion of distillation gas from coke-ovens and the like containing the sulphurous acid are brought into contact with washing liquor previously rendered alkaline by the absorption of ammonia from the distillation gas; the alkaline liquor absorbing the sulphurous acid and the same liquor being then again conducted into contact with the distillation gas containing ammonia to be again rendered alkaline, and, after depositing the salt, being again brought into contact with the products of combustion. The constantly circulating washing liquor thus forms, at different stages in its circulation, an agent for the reaction of the two bodies given up to it, and obviates the mixture of the gases of distillation and combustion; the sulphate or sulphite of ammonia formed being continuously removed from the washing liquid.

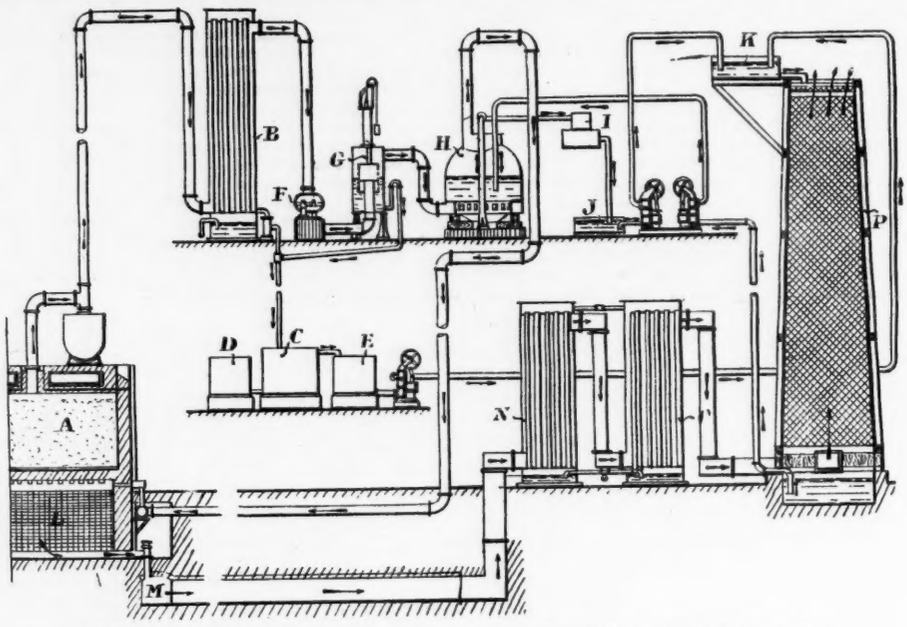
To prepare useful condensing liquors for more efficiently collecting

* See "JOURNAL," Vol. CVIII., p. 477.

ammonia evolved from coke-ovens, it has been heretofore proposed to use the waste product resulting from the combustion of the gases and utilize it to supersaturate impure or purified ammoniacal liquors to thereby convert the ammonia therein into an acid salt of ammonia (bisulphite of ammonia) which it is suggested was to be used for condensing purposes in collecting the ammonia from coke-oven gases.

It has been proposed, in the preparation of coal and like gas, to pass sulphurous acid gas into ammoniacal gas liquor in a purifier until acid, and to pass this liquor to and from this purifier and a second purifier into which the crude coal gas is passed; the resulting liquor being drawn off when of any desired strength, and fresh liquor or water added—if desired, continuously.

According to the present invention, however, the products of combustion from coke-oven or like distillation gas containing sulphurous acid are employed; the ammonium sulphite or sulphate being precipitated as a solid salt, as before stated.



Burkheiser's Apparatus for the Preparation of Ammonium Sulphite or Sulphate from Gases.

The illustration shows in section a plant suitable for carrying out the process according to the present invention.

The gas evolved in the retorts A and collected in the hydraulic main is first cooled down in coolers B. The condensed liquid thrown down in this operation passes into tanks C, where it separates according to its specific gravity into tar and ammoniacal liquor of which the first passes over into the tar-tank D, and the latter into the liquor-tank E. The gas is now forced by the exhauster F into the tar-separator G, which is likewise connected to the tank C, and so flows completely freed from tar and in a fine state of subdivision into and through the saturating box H, which is filled with acid liquor. The ammonia salt precipitated here is lifted out by a jet exhauster and dried by the centrifugal drier I. The alkaline mother liquor runs away into the trough J, and thence to the tank K. The gas now passes back to the furnace A, where it serves for heating in the known way. The waste heat passing through the heat economizer L into the passage M, and to which is added the products of combustion of the part of the distillation gas which is burnt under the steam-boilers, is brought to a suitable temperature in the coolers N O, and then traverses the scrubber tower P, which is built after the manner of a chimney cooler, and where it is scrubbed with the liquid from the tank K. To the liquor which collects here is added the gas liquor from the tank E. This gas liquor may, however, be forced to a distilling column in the usual way, and the waste vapours again supplied to the distillation gas coming from the retorts. As the liquor in the tank K must be alkaline in any case, the addition of gas liquor is of no consequence here, and the dilution of the liquor at this point is also of no importance.

In this method of working, the following reactions take place: The sulphurous acid produced in the combustion of the sulphuretted hydrogen of the distillation gas is contained in a high state of dilution in the products of combustion of the latter, which consist principally of carbonic acid, water vapour, and nitrogen. Now as the liquor, which is rendered alkaline in the saturator H by the ammonia of the gas, is utilized to irrigate the washer P, and whereas the liquor which is re-acidified in this tower is passed back to the saturator, the washing-out of the sulphurous acid, as mentioned, is accomplished in spite of the accompanying gas ballast; and, furthermore, the reaction with the ammonia is brought about without mixing the gases themselves.

In addition to the task of the washing liquid (namely, that of bringing about the reaction between the ammonia and the acid and simultaneously fixing the place where the salt is obtained), it also permits the kind of salt to be influenced—that is to say, whether $\frac{NH_4}{NH_4}SO_3$ or $\frac{NH_4}{H}SO_3$ is to be formed. The mass of liquid possesses a compensating and accumulative action in that, should momentary lack of one body occur, it nevertheless holds back the other. In the case therefore of temporary lack of acid, the escape of the uniformly incoming ammonia will be prevented, and *vice versâ*.

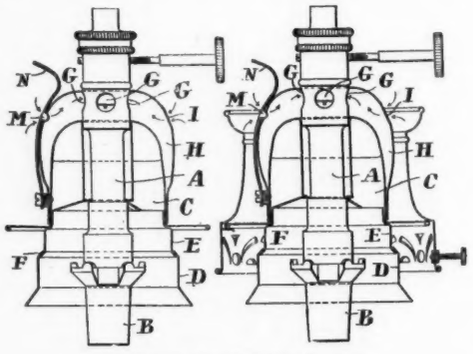
For this conversion into a salt, the new process has also, *per se*, it is said, a special value. In the ordinary process for obtaining ammonia, there is introduced into the process, together with the acid, the water necessary for the formation of the salt, as well as constantly a definite quantity of water of dilution. As now in practical working other additional quantities of water (such as rinsing water for the centrifugal salt drier) are also added, care must be taken that the quantities of water not used up in the process are continuously carried off, as they would otherwise cause the salt formed to be dissolved up. In methods worked above the normal boiling point of water, this is accomplished by evaporation; in those methods which are worked below it, by volatilization (superheating of the gases). Now in the present process, the acid is introduced in a gaseous state, and therefore completely anhydrous; and the washing liquid once added is always used again. The quantity of additional water can, therefore, be easily so proportioned that it corresponds to the quantity of water used up in the process. A solid salt can thus be obtained by these means without any special measures, and directly; and there is no restriction of any kind as to the favourable temperature for the separation of the tar. In other respects, even where there is a great introduction of additional water, the considerable quantity of heat contained in the products of combustion enables water to be volatilized from the liquor—the products of combustion being only cooled down to near their dew point. They are then capable of volatilizing water and carrying it away with them, because they become saturated therewith.

Inverted Incandescent Gas-Lamps.

HUBERS, J.; a communication from Julius Pintsch, Aktiengesellschaft, of Berlin.

No. 20,083; Aug. 29, 1910.

This invention relates to inverted incandescent gas-lamps in which no glass cylinder is provided and in which the chimney surrounding the bunsen tube is divided into two parts, of which the lower is movable.



A Pintsch Inverted Gas-Burner.

The illustrations show a longitudinal section in the lamp without and with an outer casing.

The bunsen tube A, provided with the nozzle B, carries a ring C and further a ring E as an extension. On the ring E, which is provided at its lower end with an outwardly extending conical flange, a ring D is slidably mounted, and carries an inwardly extending conical flange F, which, in the lower position of the ring, rests against the flange of the fixed ring. Thus the ring D, when the lamp is in its working position, automatically falls into the lower position (shown), and the length of the ring is such that it forms, when in its working position, together

with the rings C and E, a chimney "producing an increased draught." For mounting the mantle holder, the ring D can be pushed upwards on the ring E, so that it does not hinder the insertion of the holder, and will fall back automatically into its lower position after the holder has been inserted.

In the construction of the lamp shown, the bunsen tube is provided in the usual manner with openings G for the admission of air. For protecting these openings from the burnt gases, side chambers H are provided which extend from the ring C and at their upper end enclose the openings G. Into these chambers the air enters through openings I (below the openings G), which can be regulated by a shield M carried by a lever N. The side chambers, which, as stated, close off the openings G from the burnt gases, form pockets H, into which any dust entering with the air through the openings falls and can be removed afterwards.

Gas-Burners for Brazing and for Gas-Heated Furnaces.

ALLDAY, E., and NICHOLSON, A., of Birmingham.

No. 18,234; Aug. 2, 1910.

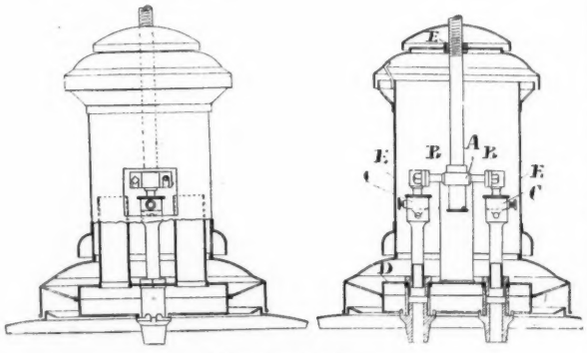
These improvements in high-pressure gas-burners for brazing purposes and all other purposes for which blow-pipe burners are ordinarily employed consist essentially in the combination with a high-pressure gas-burner of a secondary (or bye-pass) low-pressure gas-burner with means for varying at will the volume of gas passing through the high-pressure burner without reducing the pressure of the gas. In combination with high-pressure gas-burners of this kind, the patentees provide means for automatically shutting off the supply of gas to the high-pressure burner immediately the same is put down or loosed; the flame of the low-pressure burner being maintained and ensuring the re-lighting of the high-pressure burner when operated for re-use. There are also means for limiting the motion of a control lever or the like and of thereby determining the maximum flame to be produced by the burner.

Inverted Incandescent Gas-Lamps.

EHRICH AND GRAETZ, of Berlin.

No. 30,087; Dec. 28, 1910. Date claimed under International Convention, May 2, 1910.

These improvements relate to inverted incandescent gas-lamps particularly for external lighting.



A New Graetzin Lamp.

The gas-pipe has attached to it the distributing body A, which opens into a number of flanged branches B, with a series of elbow-formed flanged connections leading to the nozzles C arranged vertically below. To the latter are screwed the mixing-tubes, the lower ends of which are freely movable in glands secured to an intermediate crown D in the lamp casing. The invention consists in that the flanges are not simply provided with holes for the screws to pass through, but with slots which open downwardly. It is therefore possible, after loosening the screws, to draw the flanges upwardly, together with the nozzles and mixing-tubes carried thereby, and in this manner to remove them from their position. This is also rendered possible by providing openings at corresponding positions in the wall of the casing normally closed by plates, a rotatable hit-and-miss slide, or the like (not shown).

Access to the interior of the lamp is had through the openings, and the mixing-tubes can be taken out through these openings after loosening the connections from the gas supply branches. It is thus possible to remove dirt retained in the burner and examine the nozzle without the necessity of dismantling the lamp and without removing the mantles from their position. The openings also serve for the purpose of gaining access to the regulating screw of the nozzle, so as to regulate the air for the burner.

Gas-Calorimeters.

MACKLOW-SMITH, A., of Queen Anne's Chambers, Westminster.

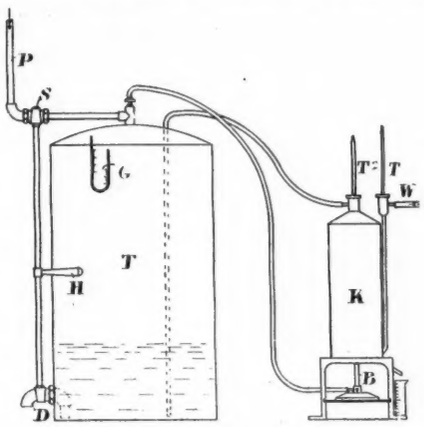
No. 25,336; Nov. 1, 1910.

This invention has for its object to provide a means to obtain the calorific value of a gas by passing water through an ordinary calorimeter into a closed vessel containing the gas, thereby displacing an equal volume of the gas, which is burnt in the calorimeter in the usual way. The advantage obtained is said to be that neither the gas nor the water need be measured; the calorific value being obtained by multiplying the rise of temperature of the water as it passes through the calorimeter by a constant, because

$$\text{Calorific Value} = \frac{\left\{\begin{matrix}\text{Rise in Temperature}\\ \text{of Water}\end{matrix}\right\} \times \left\{\begin{matrix}\text{Volume of}\\ \text{Water}\end{matrix}\right\} \times \left\{\begin{matrix}\text{Density of}\\ \text{Water}\end{matrix}\right\}}{\text{Volume of Gas} \times \left\{\begin{matrix}\text{Density of}\\ \text{Gas}\end{matrix}\right\}}$$

Since the volume of the gas displaced equals the volume of the water,

Calorific Value = Rise of Temperature × A Constant.



Macklow-Smith's Gas-Calorimeter.

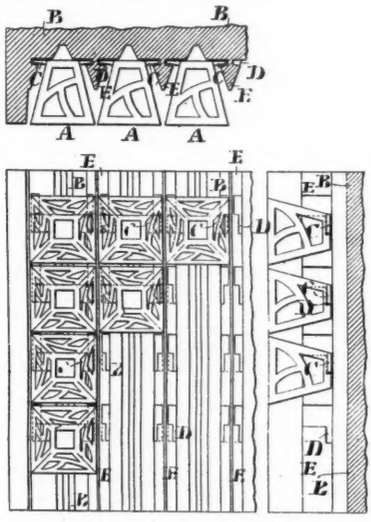
The apparatus comprises a closed tank T, to which the gas to be tested is supplied through a pipe P provided with a cock S. The upper part of the tank is fitted with a pipe leading to an ordinary bunsen burner B, in which the gas is burnt in the calorimeter K. Water enters the calorimeter at W and passes to the tank T, there displacing an equal volume of gas at any desired pressure, which is measured by means of a pressure-gauge G. When the tank is full, the drain cock D is opened by means of the lever H, which will also open at the same time the gas-cock S, thereby allowing a fresh sample of gas to enter the tank as the water passes away. When the tank is full of gas, both cocks S and D are closed, and the temperature of the water noted as it enters and leaves the calorimeter by thermometers T^1 and T^2 or other means.

Gas-Fires.

CARPENTER, C. C., of Old Kent Road, S.E.

No. 25,849; Nov. 7, 1910.

This invention refers to gas-fires of the kind in which the flame from atmospheric gas-burners is used for heating fire-clay structures arranged in front of a vertical or slightly inclined fire-clay backing retained within a metallic or other suitable case or framing. The object of the invention is to secure increased efficiency in such fires "by providing a special form of fire-clay structure attached to the fire-clay backing in a position suitable for the flames to play upon."



Carpenter's Gas-Fire "Pyramids."

The illustration shows front, side, and plan views of a fragment of fire-backing with the fire-clay structures embodying the invention fitted thereto in one of the ways claimed.

The fire-clay structures A are in the form of hollow truncated pyramids. They are built up of lattice or open basket-work, so that the flames from the burners pass freely through them transversely. They are attached to the fire-clay backing B by their smaller ends, so that they present a hollow pyramidal interior towards the apartment which the fire is intended to warm. The form of attachment shown consists of wings or lugs C, which enter notches D in ribs E on the backing B.

The backing may, however, be furnished with hooks upon which the structures A may be hung by means of holes in their smaller ends.

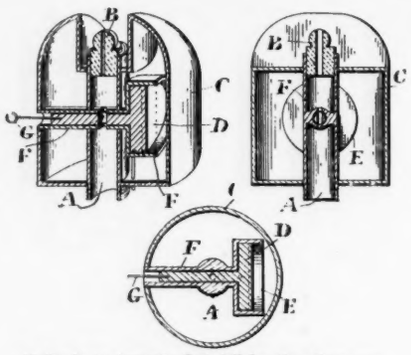
The flames from the burners (which are as usual in such fires and are not shown) pass upwards through, as well as around, the structures A, and "make them very hot internally as well as externally, and the internal surfaces, being pyramidal, are therefore able to transmit by radiation considerable heat to their surroundings."

Automatic Cut-Offs for Gas-Burners.

KELLEY, J. H., of Moose Jaw, Saskatchewan, Canada.

No. 29,453; Dec. 19, 1910.

This automatic cut-off device extends alongside, and in close proximity to, the burner flame, and controls a passage leading to the burner—maintaining it open by the expansion of the gas in the chamber as long as the burner is alight, but automatically closing it if the flame is extinguished.



Kelley's Automatic Cut-Off for Gas-Burners.

The burner-tube A is surrounded by a gas-tight chamber C, constructed of thin metal, and cylindrical in form; the upper part of the chamber being provided with wings which project slightly above the burner B on opposite sides. The air in the wings will thus be heated by the burner, and yet the wings will not substantially obscure even the non-luminous part of the flame. Upon the flame being put out, the air sealed in the chamber C contracts, and means are provided (operated by this contraction) for shutting off the passage-way through the burner. These means comprise a plunger D mounted to reciprocate within a cylinder E, one end of which opens within the air-chamber C, and the opposite end of the cylinder being connected to a sleeve F, which extends transversely across the burner-tube and fills it—the sleeve opening through one side of the chamber C.

The plunger is provided with a stem which fits the sleeve; and the sleeve and stem are provided with ports adapted to register with each other when the plunger is in the innermost position (as shown). All the gas passing through the burner-tube must flow through the ports; and when they are out of registration with each other, no flow of gas can take place. Upon contraction of the air in the chamber C, the piston will be drawn to the position shown in dotted lines, which will bring the ports out of registration and prevent the flow of gas.

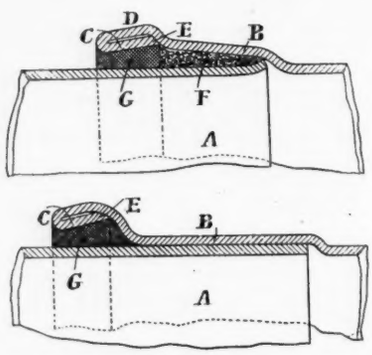
In lighting the burner, it is necessary to move the plunger to the innermost position, and retain it in this position for a few seconds until the air or gas in the chamber C becomes heated sufficiently to keep the plunger in the innermost position. To enable this to be done, an operating handle G protrudes beyond the outside of the chamber C.

Faucet-End for Pipes and Tubes.

STEWARTS AND LLOYDS, LIMITED, and STEWART, J. G., of Coatbridge.

No. 3189; Feb. 11, 1911.

The object of this invention is to strengthen the sockets or faucet-ends of steel and wrought iron pipes, by making them somewhat longer than usual—the part constituting the extra length being folded back or doubled over inwardly upon the socket so as to give a double thickness round the rim, and thus strengthen the socket and enable it to resist damage in transport and the heavy strain when caulking the usual lead joint.



Stewarts and Lloyds' Faucet-Ends for Pipes.

The illustration shows spigot and faucet joints in section—a joint of the flexible type and one of the rigid type.

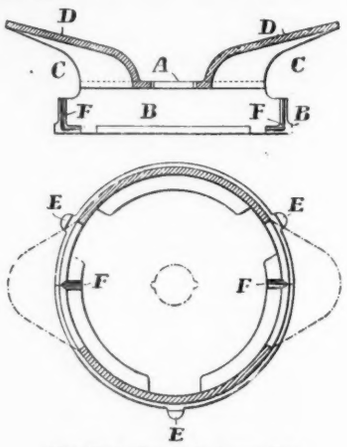
A is the spigot end of the one pipe and B the faucet end of the other pipe. As will be seen, the faucet is made with an extension C, which is folded or doubled over inwardly upon the body of the faucet so as to constitute a deep rim of double material—the part C being more or less flat and preferably parallel to the part D. The part C is preferably made with a bevelled edge at E, so as to lie closely against the body of the faucet. The double rim C D is inwardly inclined; the internal diameter of the socket being greater at the end of the part C than at the socket mouth—a formation tending to hold the packing in position. F represents packing of jute or similar material, and G packing of lead or cement.

Gas-Lamps.

CHANDLER, D., of Old Kent Road, S.E.

No. 4919; Feb. 27, 1911.

This invention refers particularly to inverted incandescent gas-lamps which employ a top made of porcelain, earthenware, or the like furnished with a depending flange for supporting the lamp globe or shade. In such lamp tops it is found, the patentee asserts, that the flange expands unequally with the rest under the heat of the flame, and consequently the flange is liable to split—the fraction extending in unexpected directions and generally completely destroying the utility of the whole structure. Having ineffectually attempted to prevent the cracking and splitting in various ways, he has "conceived the idea of regulating and controlling it so that the split, when it takes place, shall assume the form only of a slight crack or cracks in an unimportant position." Accordingly, in course of manufacture he weakens the flange in one or more places, so that, when the heating-up of the lamp top takes place, the flange gives way at the weak places only, "which are so situated that they do not prejudice or injuriously affect the utility of the structure."



Chandler's Porcelain Lamp Top.

He illustrates his invention as shown. A is the top part of the lamp top and B the flange. The top part is flat, with a pair of apertures C covered by ears D to provide an exit for the heat. The flange, provided with hooks E, notches, slots, or the like, and which performs all the offices of a gallery, is weakened by reducing its thickness by means of grooves F. The whole structure is moulded and baked in the ordinary way, and during the operation it will retain its proper form.

To complete the treatment of the structure for use it is heated unequally, so that the expansion of the top part A and flange B is unequal. The result is that there are formed at the weakened places fine cracks, which "permit of irregular expansion in use and render the structure immune from destructive fracture when heated by the flame of the lamp in ordinary use."

APPLICATIONS FOR LETTERS PATENT.

15,964.—ROYSTON, E. R., "Methods of treating materials." A communication from the General Reduction Gas and Bye-Products Company. July 10.

15,969.—MALLET, P. A., "Gasification of caking coal in closed generators." July 10.

16,027.—GREEN, H. J., "Gas-producers." July 11.

16,028.—HOLLIS, M. S., "Stop-cocks." July 11.

16,041.—REYNOLDS, A., "Regenerating furnaces." July 11.

16,147.—LAFITTE, J., "Diffusion of light." July 12.

16,148.—LAFITTE, J., "Increasing the efficiency of a source of light." July 12.

16,168.—CHADWICK, J. B., and HOLLINSHEAD, P., "Working gas-producers." July 12.

16,177.—BONE, W. A., WILSON, J. W., DOUGLAS, C., and ZORTMAN, I. H., "Producing heat by the combustion of gas." July 13.

16,193.—CORNER, J. T., "Fluid-tight joints." July 13.

16,213.—CUTHBERTSON, C. J., "Air-gas apparatus." July 13.

16,250.—PACE, P. C., "Manufacture of air gas." July 14.

16,296.—DIEREN, T. VAN., "Gas-lighting apparatus." July 14.

16,311.—CLARKE, H., and CAMPBELL, J. A., "Closure devices or cover-plates for retorts." July 14.

16,341.—CHRISTIE, J., and CLEMENT, J. P., "Gas-ovens." July 15.

16,344.—PARSONS, W., "Geysers." July 15.

16,373.—PICTET, R. P., "Process of manufacturing a mixed gas." July 15.

16,381.—CLARKE, H., and CAMPBELL, J. A., "Retorts for the destructive distillation of coal." July 15.

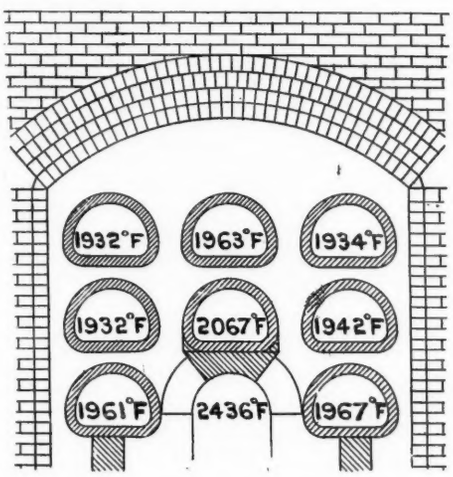
16,384.—RESCHOTZKOWSKI, G., "Troughs for scurfing gas-retorts." July 15.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Controlling the Heat of Retorts.

SIR,—We notice that in the issue of the "JOURNAL" for July 4, p. 41, a patent is described taken out by M. Pierre Jacques, whereby heats on the retorts throughout their length are controlled by means of dampers situated at the top of the setting. We wish to draw attention to patent No. 14,637 taken out in the year 1906 by our Mr. R. M. Brooke, in which patent (for which we are the sole agents), the stay-walls of the setting are extended downwards through the regenerator—dividing the setting and regenerator up into separate compartments or sections, each section being provided with a separate damper at the bottom of the regenerator for controlling the heat on the retorts throughout their length. These dampers, being at the bottom of the regenerator in a comparatively cool position, are not liable to fuse or stick, as must be the case with M. Pierre Jacques' arrangement.



In proof of our claim to superior control—not only in regard to adjustments over the length of retorts, but also of the several temperatures throughout the setting—we submit a diagram of a setting of eight on Brooke's principle, with the average temperatures recently taken over several weeks' working after the retorts had been in constant use for more than twelve months.

ROBERT DEMPSTER AND SONS, LTD.,
Elland, July 21, 1911. J. W. BROADHEAD, Managing Director.

Testing Hot-Water Appliances.

SIR,—*Apropos* of the meetings of the inspectors and members of the staffs of the London Gas Companies at these works in connection with the testing of apparatus for hot-water supply, we should like it to be generally known that an open invitation exists to the engineers, inspectors, assistants, and others connected with gas undertakings throughout the country; and arrangements can be made for anyone interested to pay a visit of inspection and carry out tests according as the time may permit.

The extensive manner in which this matter has been taken up makes it impossible for us to write to companies individually; and we should therefore be obliged if you will publish this letter.

THOMAS POTTERTON.
Cavendish Works, Balham, S.W., July 22, 1911.

Use of High-Pressure Gas for Industrial Purposes.

SIR,—There appeared in your last issue a letter from Mr. E. W. Smith, written in reply to some of the criticisms of his recent paper on the "Uses of High-Pressure Gas." On comparing that paper with his letter, I notice that Mr. Smith has made several important admissions which serve to show that I was justified in condemning some of his former claims as being extravagant. He has negatived some of his original statements, and now says that he has been misunderstood, owing to the results of his experiments being published without sufficient explanation. This is surely a somewhat scathing criticism of the value of his own paper.

With regard to his gold-melting experiments, I append, side by side, the following quotations taken (1) from his original paper and (2) from his recent letter.

(1)

"A series of tests have recently been carried out . . . One of the objects was to determine the relative costs of melting gold in 100 oz. lots, with coke, air-blast and gas, and high-pressure gas."

(2)

"My object in publishing the results of a certain number of comparative experiments in the paper was by no means to show what a high-pressure appliance could do compared with the best types of other appliances, but to show what a high-pressure appliance could do compared with the appliances and methods most generally employed in the application under consideration for the time being. That is what one has to contend with when advocating the use of any system."

In my previous letter, I pointed out that the results given by Mr. Smith implied that for gold melting, high-pressure gas was six times as efficient as low-pressure gas worked in conjunction with an air-blast. I commented on this, and said that I failed to see how high-pressure gas could be much more efficient than low-pressure gas and an air-blast properly used. Mr. Smith now admits that in Birmingham they obtain quite as good results by means of low-pressure gas and air-blast as with high-pressure gas, so far as temperature and fuel efficiencies are concerned.

It appears that the blast used in conjunction with the low-pressure gas in the tests under consideration was obtained by the use of a foot bellows, the work of pedalling being done by a boy who is paid at the rate of 4½d. per hour—3s. per day of eight hours is surely a very good rate of pay for a boy doing this type of work. Mr. Smith knew that this was a highly inefficient process, and yet he did not take the trouble to explain in his original paper that this was the application of low-pressure gas and air-blast that he had under consideration when making his comparison.

In the case of the coke test which he described, the thermal efficiency is ridiculously low. The cost of fuel is given as 3d., as against ½d. in the case of high-pressure gas. And assuming the cost of coke to be 15s. per ton, his figures imply that his high-pressure system has over ten times the thermal efficiency of a coke-fired furnace; or, taking the cost of fuel as the basis for comparison, the high-pressure system is six times as efficient as a coke-fired furnace. In his letter, Mr. Smith tells a very different story; for there he says "brass can be melted by means of coke in a certain special kind of furnace at a cost which prohibits all competition from gas, on fuel costs alone." I see no reason why the same should not hold in gold melting; so that if a proper furnace were used, coke would prove to be the least costly fuel—a conclusion which one would not arrive at on reading the summary of the tests published in the original paper.

The quotation given above from Mr. Smith's original paper is quite definite. The results of the three tests were published side by side; and if one refers to the early part of the paper (a portion of the paper Mr. Smith himself is so fond of referring to), it will be found that he there states that "the main object in experimental work on gas-heated appliances is to attain the highest efficiency." So that on reading the paper the impression given is that truly comparative tests have been carried out, and that from the fuel point of view better results are to be obtained with high-pressure gas than can be expected with either coke or low-pressure gas and air-blast. Now, according to Mr. Smith's letter, air-blast and low-pressure gas are quite as efficient as high-pressure gas; and from the point of view of fuel cost coke is better than either. So that it is to be hoped he will see the advisability of altering the wording of this portion of his paper before it appears in the "Transactions" of the Institution, and so avoid all possibility of his meaning being misunderstood.

Mr. Smith complains that I have been severe in my criticism of his paper, and that I am apparently labouring under a misapprehension as to his attitude towards the subject of high-pressure gas. If, after reading his Glasgow paper, I did not properly understand his attitude, I have been put right by the quotation from his letter which I give above—quotation No. 2. The paragraph winds up with the remark, "That is what one has to contend with when advocating the use of any system." So I conclude that Mr. Smith did not wish his paper to be regarded as a scientific communication, but that his intention in reading it was (to quote him again) "not so much to teach, as to place before the Institution a little of the experience gained in connection with the high-pressure gas laboratory. . ."—experience gained apparently as to what one has to do when advocating the use of any particular system.

I pointed out that the percentage of the available heat that was transferred to the gold in these experiments was very small. Mr. Smith agrees with me, but adopts the line of argument that, after all, fuel efficiency is of relatively small importance in this case. I have no doubt that his remark applies to the aluminium melter; but the present discussion is on the subject of occasional gold-melting by jewellers. Taking the data given on this subject, the labour charges appear to me to be too heavy. In the case of the high-pressure furnace, surely it is not necessary for a man to stand watching the furnace during the operation? It will take but a small time to start-up, and will require very little attention; so that the actual time that a man need give to it would be small, and fuel costs would certainly be of primary importance. In the case where a foot-bellows is employed, it would be necessary to have a boy for pedalling. But if he was sufficiently useful to be paid at the rate of 18s. per week, then he ought to be quite capable of controlling the melting, without the necessity of employing an additional man at the rate of 9d. per hour for this purpose. If, as Mr. Smith postulates, it is really necessary to have a man at 9d. per hour to watch the melting, then I venture to think that the jeweller who uses the low-pressure gas supply would be quite justified in expecting the man to work the foot-bellows also. The difference between the cost of melting the gold by this inefficient process and by means of high-pressure gas would then be 2½d.—that is the difference in the cost of gas given by Mr. Smith. I would also like to remind him that he remarked in his original paper that much dissatisfaction had been expressed, by the jewellers themselves, with gas-heated appliances, owing to their bad design and wasteful consumption. It is evident that, however much may be said to the contrary, the jeweller keeps his eye on the gas bill.

The next point in Mr. Smith's original paper that I discussed was his iron-pot test. On referring to the paper, it will be found that he prefaces all account of these experiments with the following statement: "Another field in which high-pressure gas has not only an advantage over low-pressure gas, but in many cases over coal and coke, is in the heating of liquids. He then goes on to say that, although an increased efficiency had been expected, the increase obtained was surprising. The tests themselves are labelled "Comparative Tests;" and the whole thing is described in a grandiloquent manner. The letter now explains what was meant—the heating of water in the outer shell of a glue-pot. Why was Mr. Smith not more candid in his original paper? Here, again, I venture to think that he has expressed himself in a misleading manner. One now understands the 47·5 per cent. efficiency obtained

with the low-pressure gas supply; and it is to be hoped that Mr. Smith will clearly indicate in his paper that he is here discussing glue-pots.

But as he was considering this application of gaseous heating, why did he trouble to lag the pots, and why attempt to cut-down heat losses? The average man when using a glue-pot does not take this trouble. No doubt these tests are of value to the gentleman who used the large number of glue-pots, but as comparative tests of the efficiency of high and low pressure gas when used for water heating, they are worthless. These are the tests which have been cited in support of the remark that the heating of liquids is a field in which high-pressure gas has an advantage over low-pressure gas. I can assure Mr. Smith I entirely agree with him that the tests are of no academic utility; but I should like to remind him that tests of any real industrial value are of necessity of academic value. With the high-pressure gas, he obtained 92 per cent. efficiency. I am curious to obtain further information concerning this; and in my previous letter I asked for details of the methods adopted for cutting-down heat losses in each case. In addition, I asked for information concerning the weight and size of the iron pot. I should be obliged if Mr. Smith would supply this information. I also asked Mr. Smith the following question: Why, since he intended these tests to be parallel, was the rate at which he burnt the gas in the high-pressure experiment considerably higher than that in the case of the low-pressure experiment? I fail to see any answer to this in Mr. Smith's letter.

Finally, with regard to the points raised about the statements made in his reply to the discussion on the paper at the Institution meeting. I note that he has accepted, without comment, my correction of his remark about the radiation from flames, and that he has made the necessary addition to correct his statement concerning the variation of the temperature with the size of a flame. But with regard to his phrase "initial temperature of combustion," while stating it to be ambiguous, he makes no attempt to explain what he means by it, but, avoiding the point at issue, makes some general remarks, and finally winds up with the phrase "the better the mixture of gas and air before combustion takes place the higher will the flame temperature be." The correctness of this statement is entirely dependent upon one's conception of flame temperature, and will be accepted by the majority on the assumption that by flame temperature is meant the average temperature throughout the flame. This phrase is very different from the one Mr. Smith used in the first instance. At Glasgow, he said "the better the mixture of gas and air the higher the initial temperature of combustion." Will Mr. Smith say definitely what he regards this phrase as meaning, and, at the same time, state what grounds he had for making such a statement? I am of the opinion that Mr. Smith's letter has put an entirely different complexion on the comparative tests which he published, and has shown them up in their true light.

HAROLD HARTLEY.

10, *Eldon Place, Leeds, July* 19, 1911.

Corrosion of Service-Pipes.

SIR,—With one exception, there is nothing in Mr. M'Leod's letter, in your last issue, calling for further comment. I am content to leave the main subject with my letter of the 6th inst. [*ante*, p. 112]. The question has become simply one of definition; and Mr. M'Leod's own definition supports my position. In the final sentence of his last week's letter, however, he says he "did not define acidiferous subsoil in the way stated by Mr. Hole." The definition was a double-barrelled one. An acidiferous subsoil is this or that, or I suppose both. I give the definition in full: An acidiferous subsoil is "*a subsoil which* is in itself, or *contains* in itself, *substances which are acid in character*, and which will give an acid reaction when partially dissolved in water." The italics are mine, and form the alternative which I adopted. You will see that there is no misquotation whatever.

WALTER HOLE.

Leeds, July 19, 1911.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

METROPOLITAN WATER BOARD (NEW WORKS) BILL.

After the third reading of this Bill on Tuesday,

The DUKE of NORTHUMBERLAND moved to insert a new clause providing that, "if any operations of the Board for the purposes of, or in connection with, the construction of any reservoir by this Act authorized has caused any diminution of the supply of water from any well, borehole, pond, pool, spring, stream, or watering-place, or other source of supply existing at the date of the passing of this Act within the Administrative County of Middlesex, and within a radius of two miles from the site of any such reservoir," the Board should repay to the owner all costs and expenses reasonably incurred in obtaining an additional supply. He said the Water Board proposed to make two very large reservoirs in Middlesex. It was intended to dig a ditch round the reservoirs down to the London clay, which in some places was 110 feet below the surface; and the length of the ditch would be about five miles. The effect of the operations of the Board would, it was apprehended, deplete all the wells in the surrounding district, which was full of small owners and occupiers who had these wells; and the distress for water would in consequence be very great. He quoted from the evidence of the Engineer of the Board to show that the danger was a real one, and that the loss could be made good at small cost.

The EARL of KINTORE, the Chairman of the Joint Committee who considered the Bill, expressed a hope that their Lordships would not agree to the new clause. He pointed out that the Bill contained provisions of great public interest, that the Joint Committee had devoted some time to the inquiry, and that the decisions arrived at were practically unanimous and generally accepted by the parties affected. A clause similar to the one proposed had been pressed on the Committee by the Middlesex County Council; but as the Bill related to surface or river water, the Committee thought it would be improper to allow compensation before a thorough inquiry was held. He hoped the Local Government Board would soon institute such an inquiry.

Viscount HALDANE said the question at issue did not, strictly speaking, arise out of a Public Bill; but it was of such far-reaching importance, and affected so many rights, that it well deserved the attention it had received. He felt that the Joint Committee had done the best that could be done in circumstances in which action was absolutely necessary. He did not think the clause suggested could be supported either on the ground of law or in the face of the recommendations of the Joint Committee. If these were departed from, he felt that they would be making a precedent, and throwing this class of legislation into a state of uncertainty.

Lord NEWTON suggested that the question might be amicably settled if a pledge given by the Engineer to the Board were carried out, and a supply of water equal to that of which they were deprived were given to those who were prejudicially affected.

Lord MACDONNELL, the Chairman of the Joint Committee on the Protection of Water Supplies Bill, gave an account of the conclusions of the Committee, and said it was a matter of extreme importance that the question should be further and fully inquired into.

The MARQUIS of SALISBURY said in Hertfordshire they had suffered enormously. It was not proposed that the making of large water reservoirs should be prevented. The only point was whether it was just or unjust for the Water Board to give compensation for any injury their works inflicted. The injury was universally admitted; and the only reply was that they should wait for the appointment of an important Commission who had not yet been nominated, who might sit for years, and whose finding might, after a considerable interval, be followed by legislation. Meanwhile, all people affected must go on suffering.

The EARL of DONOUGHMORE (Chairman of Committees) thought it was frankly admitted that there were no exact precedents to the case submitted. It might or might not be desirable to give general protection; but those who had gone into the matter most closely felt that there was not enough information on which to make up their minds. In view of all the facts, and considering that the clause was one asking for protection for people who had not thought it worth while themselves to come and ask for it, he should regret any decision going behind that of the Joint Committee who considered the Bill.

Lord ALVERSTONE remarked that what seemed to be overlooked in the argument of the noble earl was that what was asked for was not protection for the abstraction of water when the works were made, but while they were being carried out. He was satisfied that there were many precedents in Private Bills for compensation being allowed where wells were temporarily interfered with during the construction of works, and that the clause could not be resisted upon the ground that there was anything in principle against it.

Viscount ST. ALDWYN suggested the adjournment of the debate, in order that the Water Board might confer with the noble duke and those who were supporting him, with a view to seeing whether some clause could not be framed which would extend the same compensation as was given by the Bill to Lord Fitzhardinge to cases where it could be definitely shown that the same kind of injury might be done temporarily. To raise this point, he moved the adjournment of the debate.

Viscount HALDANE said the course just suggested was not one which could be disposed of quickly. As he understood, this Bill pressed; and, though he did not like the noble duke's clause, he would rather take the Bill with it than risk the loss of it by entering upon the inquiry which the noble viscount had suggested.

The motion for the adjournment of the debate having, by leave of the House, been withdrawn, a division was taken, and the clause was rejected by a majority of 31.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: St. Helens Corporation Bill.

Bills reported: Belfast Corporation Bill, Gas and Water Orders Confirmation Bills (Guisborough Water Order and Unopposed Orders), Gas and Water Orders Confirmation Bills (Nos. 2 and 4), Local Government Provisional Orders (Gas) Bill, Local Government Provisional Order (Gas) Bill (No. 2).

Bills read the third time and passed: Gas and Water Orders Confirmation Bill, Gas Orders Confirmation Bills (Nos. 2 and 4), Metropolitan Water Board (New Works) Bill.

The Margam Urban District Council Bill and the Rotherham Corporation Bill have been referred to a Select Committee, consisting of Lord Lamington (Chairman), the Earl of Eldon, Lord Digby, Lord Wynford, and Lord Brabourne; and they commenced sitting yesterday.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Gas Orders Confirmation Bills (Nos. 2 and 4), Gas and Water Orders Confirmation Bill, Metropolitan Water Board (New Works) Bill.

Bills read the third time and passed: Chester Water Bill [Lords], St. Helens Corporation Bill.

The Merthyr Tydfil Corporation Water Bill [Lords] and the Swansea Gas Bill [Lords] have been referred to a Select Committee, consisting of Sir Edwin Cornwall (Chairman), Sir Edward Beauchamp, Mr. Page Croft, and Mr. Ronald M'Neill; to commence sitting to-day.

Gas Workers' Agitation at Douglas.—The employees in the works of the Douglas Gas Company, as well as the lamplighters, some days ago presented to the Directors a demand for increased wages. The retort-house hands asked for 5s. per eight-hour shift, as against the 4s. 6d. now paid; and the yardmen, for 4s. a day, in place of 3s. 6d. The lamplighters requested that their wages should be increased to 23s. 4d. per week.

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LEGAL INTELLIGENCE.

THE ALLEGED MISUSE OF GAS AT FALKIRK.

In the Falkirk Sheriff Court on Monday of last week, before Sheriff Substitute MOFFATT, Bailie Henry Russell was summoned under the charge which was announced three weeks ago, when the previous complaint was found by the High Court to be irrelevant—viz., that, having within the premises known as the Crown Brass Works, Falkirk, belonging to and occupied by him, a service of gas manufactured by the complainers under provisions of the Falkirk Corporation Gas Acts, 1894 to 1910, for which he was liable to pay to the complainers at the rate of 2s. 9d. per 1000 cubic feet for the gas used by him for ordinary lighting purposes, and at the rate of 2s. 4d. per 1000 cubic feet for the gas used by him for power purposes, and having, without the complainers' authority, and at some date to the complainers unknown, connected a pipe with the main outlet pipe from the power meter situated within his premises, he did, on Wednesday, Jan. 11, 1910, fraudulently use for lighting purposes gas so supplied by the complainers for power purposes, contrary to section 38 of the Gas-Works Clauses Act, 1871.

Mr. W. J. GIBSON, on behalf of the accused, at once objected to the relevancy of the complaint on two grounds—first, that an offence was not set forth within the meaning of the section libelled, and, second, that the complaint was lacking in specification, in respect that it did not state on what ground, and whether under Statute or by agreement, the respondent was liable in the differential rates. The gas supplied, it was argued, had passed through the meter, and was therefore the property of the respondent, and not the property of the undertakers. It did not matter to the undertakers, so far as the section was concerned, what was done with the gas, so long as it was paid for. There might be a breach of contract, if a man used gas for one purpose which was supplied for another. But that was a civil matter, and not one for a penal prosecution. The meter was an automatic device for delivering the commodity. It was an instrument which stood between the undertakers and the respondent, which gave delivery to the respondent on the one hand, and which ascertained the price for the undertakers on the other. The words of the Statute ought to have been rigidly adhered to in the charge. It was important, under his second objection, that the respondent should know under what resolution or other authority the complainers had imposed differential rates, as, in the event of the respondent proving that such authority was inept, the charge would not lie.

Mr. H. P. BLACK, for the Corporation, argued that if the contentions of his friend were sound, there could not possibly be an offence under the section libelled. The sting of the complaint was that the respondent had got gas for certain purposes at a cheap rate, and had applied it for another purpose for which he would have been charged a higher price; and that this constituted fraudulent use within the meaning of the section. The use could not be ascertained till it was seen to what purpose the gas was actually put after it had left the meter. The fraudulent use only arose after the gas had passed the meter. Section 13 of the Gas Act of 1910, referred to in the body of the complaint, clearly gave the complainers power to impose differential rates.

The SHERIFF asked what was the difference between ordinary lighting and private lighting.

Mr. BLACK replied that the terms, in his view, were synonymous, but there was confusion among the Statutes, in some of which the phrase was "ordinary lighting," while in others it was "private lighting."

The SHERIFF took time to consider his decision upon the questions which had been raised in the discussion.

Gas Workmen's Bonus not Attachable.

At the Edmonton County Court last Friday, his Honour Judge Wheeler, K.C., heard a summons issued by Messrs. Rogers, of Edmonton, who asked for an order to attach money alleged to be due from the Enfield Gas Company to one of their workmen named Whithead, against whom plaintiffs had obtained judgment for £2 17s. 3d. It was stated for them that Whithead had a sum of £8 to come from the Gas Company. Mr. C. W. Offord, the Secretary of the Company, said they maintained that this money was wages, and therefore was not attachable. The Company had instituted a scheme under which, if the price of gas was reduced, they allowed the men a certain percentage on their usual wages, and this was payable once a year. It had nothing to do with the profit, but was a reward for services. His Honour declined to make the order.

Return of Overpaid Water-Rate.

At the Lambeth County Court last Friday, a case of exceptional importance to the public came before his Honour Judge Parry. The Electric Palaces, Limited, of Atlantic Road, Brixton, sued the Metropolitan Water Board for the recovery of £31 in respect of overpaid water-rate. The defence put forward was that, by the Public Authorities Protection Act, the Board were not liable to have claims brought against them after the lapse of a period of six months. Giving judgment for the amount claimed, with costs, his Honour said the case raised an interesting and important point as to the Local Authorities Protection Act; the question being whether the Water Board, having been paid this money in error, could keep it. The Board put forward the technical defence that they were protected by the Act. But he held that the Act calculated the date from which the six months' limitation should apply from the time the money had been paid; and, as the claim was made within six months after payment, the Board should return the money.

Provision of Water Supply on Each Floor.

At the Old Street Police Court, last Thursday, Mr. John Cooper, the owner of a number of tenement houses in Crondall Street, Hoxton, appeared in answer to summonses taken out on behalf of the Borough Council of Shoreditch for failing to provide an adequate supply of water to the premises. It was stated by Mr. Ray, the Solicitor to the Council, that on the 15th of March last an order was made on the defendant by the sitting Magistrate, Mr. Biron, to provide a water supply to rooms above the ground floor; and a penalty of 21s. and costs was imposed. Since then nothing had been done in regard to the supply for three houses until the present summons had been served; and, in consequence, it was asked that a penalty for non-compliance with the order should be imposed. Evidence having been given that there was but one water supply for the whole house in each of the cases mentioned (and that in a back yard), Mr. Cluer said it was unreasonable for a man not to provide a proper water supply for each floor. Penalties of 20s. were imposed in all cases, with two guineas costs in respect of one house, and 30s. costs on each of the others.

Liability for Damage to Lamp-Posts.

At Brierley Hill, on Monday last week, adjourned actions brought against Mr. Zachariah Cartwright, farmer, of Himley, for accidentally breaking two electric lamp-posts at Wordsley, in respect of each of which £5 was claimed as damages, were brought up for the Magistrates' decision. At the previous hearing, Mr. G. F. James (the Clerk to the Kingswinford Rural District Council) stated that in January last, as Mr. Cartwright was about to step into his gig, the horse bolted and knocked down a lamp-post. It continued its career and knocked down a second lamp-post. The claimants contended that the defendant was liable to the extent of £5 damage for each lamp broken. The defence of Mr. Taylor (Messrs. Willcock and Taylor, of Wolverhampton) was that, according to the Gas-Works Clauses Act, 1847, under which the summonses were issued, the power of the Justices was limited to £5 damages in respect of any one accident, and that as both lamps were broken during one occurrence, £5 was the maximum that could be awarded. No negligence was attributed to Mr. Cartwright, who expressed willingness to pay for all damage legally claimable. The Magistrates' Clerk (Mr. Wickham King) stated that since the adjournment the parties had agreed that there was only power under the Statute to impose one sum of £5 for one accident, and not £5 per lamp. This being so, they asked for the summonses to be withdrawn; and the Bench agreed to this course.

Abstracting Water from a Hydrant.—At the Epsom Petty Sessions, two men named Taylor and Skilton, in the employ of the Dorking Brick-Works Company, were each fined 10s. and cost, for being concerned together in "stealing, taking, and carrying away" water of the value of 2d., the property of the Leatherhead and District Water Company. The water was taken from a hydrant in the road, to supply the requirements of an engine which was being driven on the highway.

Colne Valley Water Company.—At the half-yearly general meeting of this Company on the 1st prox., the Directors will report a profit of £15,239 for the six months ended the 30th ult. The balance of the dividend and interest account, after paying the interest on the debenture and preference stocks, and transferring £1000 to the contingency fund account, is £17,570. Out of this the Directors recommend the payment of the full statutory dividends at the rate of 10 and 7 per cent. per annum on the several classes of ordinary stocks, and in addition a payment of 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks; leaving £4219 to be carried forward. For the corresponding period of 1910, the amount carried forward, after transferring £500 to the contingency fund account, and paying full statutory and 1 per cent. (actual) back-dividends, was £4268.

Charge of Stealing Gas.—Mrs. Eliza Hawkins, of Mitcham, was charged before the Croydon County Magistrates last week with being concerned with her husband, William Hawkins (who was not in custody), in stealing a quantity of gas the property of the Mitcham and Wimbledon Gas Company. The evidence showed that the service and supply pipes of the meter were disconnected, and a temporary lead pipe had been fixed so that the gas did not go through the meter. Suspicions were aroused on account of the small quantity of gas apparently consumed; and an inspector who paid a surprise visit was told he could not see the meter, as it was locked in the coal cellar, and the husband had the key. After waiting for the husband's return, he forced the cellar door, and found the bye-pass arrangement in use. Accused was remanded: a warrant being issued for the husband's arrest.

The Explosion at the Effingham Street Gas-Works.—There has been a pleasing sequel to the fatal washer explosion at the Effingham Street works of the Sheffield United Gaslight Company, as recorded in the "JOURNAL" for the 4th inst. (p. 59). At the time of the accident, a fitter named Rhodes displayed conspicuous bravery in the rescue of the man Foster, who had been working under him, and who unhappily subsequently succumbed to his injuries; and for this noble act, he has been handed a handsome cheque and two written resolutions of thanks. In making the presentation, Mr. J. W. Morrison, the Chief Engineer to the Company, remarked that the Board were always pleased to recognize such splendid deeds of bravery as that which Rhodes had performed. Rhodes, who was enthusiastically cheered by the employees, thanked the Company and the men for their appreciation of his conduct.

Price of Gas at Rochdale.—It was stated at the recent quarterly meeting of the Rochdale Merchants' and Tradesmen's Association, that the Gas and Electricity Committee of the Corporation had that day decided to reduce the flat-rate for electricity for lighting purposes from 4½d. to 4d. per unit, and will at an early date consider the question of reducing the price of gas. Mr. Watson suggested that the Association should pass a resolution urging upon the Committee the desirability of the charges for gas being lowered. Extraordinary profits, he said, were being made at the gas-works, and it was time consumers had some relief. Mr. G. L. W. Foulds, the President, said that gas consumers should certainly be assisted, now that a reduction had been made in the price of electricity. The Secretary was instructed to write to the Committee and call attention to the fact that the price charged for gas was too high, especially in the case of tradesmen and large consumers, and urge them to deal with it immediately.

MISCELLANEOUS NEWS.

THE GAS PUBLICITY SCHEME.

Manchester Gas Committee and the Proposal.

The Gas Committee of the Manchester Corporation will consider at next Friday's meeting the question of contributing to the scheme of the Publicity and Special Purposes Committee of the Institution of Gas Engineers. With the notice convening the meeting, Mr. F. A Price, the Superintendent of the Gas Department, has enclosed a copy of the "Memorandum" issued in connection with the scheme, and already published in the "JOURNAL," there being an added paragraph to the effect that the contribution proposed is on the basis of 2s. 6d. per million cubic feet of gas made.

Our Manchester Correspondent says that the question has been unofficially discussed by leading members of the Gas Committee on several occasions during the past three months; and the general opinion is that, in the event of certain guarantees being forthcoming, Manchester will fall into line, and agree to the 2s. 6d. basis. As this will mean a yearly contribution of upwards of £700 for Manchester, certain members of the Committee seek for more definite assurances that they, with other corporations in the North, will have adequate representation on the spending authority under the scheme, and they hold that some stipulation should be made as to the period of years over which the subscription on the 2s. 6d. basis shall be continued. It will be remembered that in the neighbouring borough of Salford the Town Council at their last meeting, as reported in the "JOURNAL" for the 11th inst. (p. 122), approved the recommendation of the Gas Committee that the Corporation should become contributors to the scheme on the basis named.

SALFORD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Chairman of the Gas Committee of the Salford Corporation (Mr. F. S. Phillips) has presented to the Town Council their report for the year ended the 31st of March. They express their pleasure in recording that the usual growth in the number of consumers was maintained during the period named. The sales of gas have also shown an increase equal to 0·99 per cent. The demand for gas appliances generally has been satisfactory. The works and plant (under the supervision of Mr. W. W. Woodward, the Engineer and Manager) have been maintained in a thoroughly efficient condition. One of the gasholders at the Bloom Street works has been reconstructed; and it will be necessary to undertake the renewal of another gasholder at these works during the next twelve months. The coal and cannel carbonized during the past year amounted to 163,488 tons, and the quantity of gas made to 1,685,506,000 cubic feet, of an average illuminating power equal to 19·50 standard candles; the parliamentary standard being 18 candles within the borough, and 17 candles as tested in the out-districts. The total receipts realized from residuals show a considerable increase compared with last year. On March 31, 1911, all the rights, powers, and privileges of the Corporation with respect to the supply of gas in the urban district of Little Hulton, together with the mains, pipes, meters, cookers, and other apparatus belonging to the Corporation, laid or fixed in the district, were transferred to the Urban District Council of Little Hulton, in accordance with the terms of the agreement made on March 14, 1910, between the Corporation and the District Council.

The accounts show that the net revenue from the sale of gas was £179,566; residuals produced £57,779; and the total receipts were £239,703. The expenditure on manufacture was £126,972; on distribution, £15,175; on management, £8056; and the total expenses were £171,197—leaving a balance of £68,506 to go to the profit and loss account. After meeting interest and redemption charges and allowing £17,828 for depreciation, there was a balance of £15,750 transferred to the district fund account.

WARRINGTON CORPORATION GAS UNDERTAKING.

Engineer's Annual Report.

The Gas Engineer to the Warrington Corporation (Mr. W. S. Haddock) has presented to the Gas Committee his report for the past financial year. He states that the buildings and plant have been kept in a good state of repair. On the expenditure side of the accounts there was an increased cost of more than £600 for mains and ironwork, due to the purchase of more pipes at a higher price. The extra outlay on coal and cannel was owing to the use of 1800 tons more; while the increased receipts from coke, tar, and sulphate of ammonia were due to having produced larger quantities, which were sold at a slightly higher price. The receipts from gas were very disappointing. Though the output had increased by upwards of 5 million cubic feet, the receipts were £349 down, owing to the reduction in price. The unaccounted-for gas was very much increased, but was largely owing to the reading of the meters having been taken in some cases more than a month earlier than last year. Mr. Haddock said the price of fuel would be slightly lower next year; but probably the residual products would not yield quite so much, owing to a slight fall in some of them. The increased make of gas was 15,450,100 cubic feet, or 3·5 per cent. upon last year's production.

The report recently came before the Council, and was approved.

The upsetting of a tar-boiler at Milton Regis, Kent, while road-tarring was in progress, caused a big blaze in the neighbourhood of the gas-works. The fire, however, was successfully extinguished by the aid of sand.

BURTON-ON-TRENT GAS UNDERTAKING.

The Cost of the Illumination of the Town Hall.

At the last Meeting of the Burton-on-Trent Town Council, the Gas and Electricity Committee submitted their report. In the course of it, they stated that they had entered into contracts with Messrs. Parkinson and W. & B. Cowan, Limited (Parkinson Branch), for a 100,000 cubic feet per hour station meter, a 24-inch district governor, and a 15-inch safety governor; with the Bryan Donkin Company, Limited, for the necessary valves; and with Mr. Hodges, of Burton-on-Trent, for a new station meter and governor house. In the unavoidable absence of Alderman Lowe (Chairman of the Committee), the adoption of the report was moved by Mr. Wardle. In doing so, he said there had been a material increase in the output of gas. More than half of the extra 3¼ millions sent out during June was due to the Town Hall illuminations [see *ante*, p. 30]. With regard to the Barton undertaking, the Bill containing the Corporation's Provisional Order had been before the Examiner in the House of Lords, and there was no opposition. It had, therefore, to be sent forward for first reading. Mr. Wardle went on to refer to Mr. P. Holmes Hunt's paper read recently before the Institution of Gas Engineers. He said the author dealt with various systems of retorts, and incidentally remarked that "those fine installations at Burton-on-Trent and Sheffield are perhaps the leading examples of horizontal retorts erected specially for working with heavy charges." With regard to the purchase of coal, it might be of interest to state that the Committee had completed the purchase of 32,000 tons, and obtained reductions of from 4d. to 6d. on last year's prices; the average figure for this year being 10s. 5½d. per ton. Mr. Tarner seconded the motion. Mr. Birch congratulated Mr. Ramsden (the Assistant-Manager) and his staff on the magnificent display of illuminations at the Town Hall during Coronation week, and asked if it was possible to ascertain the actual cost. Mr. Wardle said the quantity of gas consumed was 2 million cubic feet, at a cost of £100. Then the outlay as regards the work entailed was somewhere about £300. The report was adopted.

REDUCTION IN PRICE AT OSSETT.

The minutes submitted by the Gas Committee at the last monthly meeting of the Ossett Town Council contained a recommendation that, as from the 1st inst., the price of gas should be reduced 3d. per 1000 cubic feet to all consumers.

Mr. H. ROBINSON, the Chairman of the Gas Committee, in moving the adoption of the minutes, remarked that he prophesied a month ago that they would be likely to save a matter of £150 on the coal contracts; and this had been effected without any trouble. The resolution reducing the price of gas to 2s. 6d. per 1000 cubic feet, he was sure, would be pleasing to the majority of the consumers. He wanted to assure Ossett ratepayers and their neighbours, the Horbury Council, that they had taken the first opportunity—judging from several standpoints, they had anticipated their first opportunity, and had done the deed before the opportunity came—of making this concession; and they would not require any pressing, or any indication or direction from any authority, to make another concession when the way opened out to them. The Corporation were reducing the price of gas 10 per cent., making 20 per cent. during the last three years. This would absorb in twelve months £1400, or more; and, as they knew, it spoiled his pet scheme of filling up the reserve fund. He had the honour to begin the reserve fund in the interest of the Ossett ratepayers, and wanted to complete it during the next year. This was now to be put off a trifle longer—perhaps one or two years. Out of the £1400, they would distribute among the Ossett ratepayers about £750, which more than equalled a 3½d. rate on the rateable value. They could only make permanent this concession, and give further concessions, according as the consumers remained loyal to them, as they had done in the past.

Mr. H. NETTLETON seconded, and said that if the proposed reduction in price meant the equivalent of a 3d. rate to Ossett, the Horbury people would get a 4d. rate, or probably more, out of it; so that, if they were reducing Ossett's rates, they were reducing Horbury's as well. There was no doubt there were members on the Council who would reduce the price of gas at every possible opportunity. He would; and the reserve fund would not be filled up in one year, as far as he was concerned.

The MAYOR (Mr. T. W. Bentley) agreed that it was a matter to congratulate themselves about that they had been able to reduce the price of gas; but he did not quite like the tone of the Chairman's remarks. Mr. Robinson seemed rather to resent, perhaps not in words, but in spirit, the action of the Horbury Council in venturing to suggest that a reduction might take place; but they would have all felt that the Horbury Council were remiss in their duty if they had not caused a letter to be addressed to the Gas Committee asking for a reduction, because, according to a statement previously made by Mr. Robinson, they were going to make such a handsome profit that he practically held out an invitation to Horbury and everybody else to ask for a reduction in the price. Mr. Nettleton practically said to Horbury: "Hands off. As soon as we can reduce the price of gas, we will." He did not think they ought to look at it in this way. Horbury, if not actually partners in the matter, had an interest in it; and when they saw that a great profit was being made in any one year, they understood what was meant by it going to the reserve fund. They were told that, when the reserve fund got to £5000, the interest must of necessity go to the district rate—not that it "may," but that it "shall." Now, Horbury people had their eyes open, as well as Ossett people, and naturally they wanted gas at the lowest possible price. Mr. Robinson referred to the reduction as something in the shape of a concession in regard to rating. Personally, he disassociated the gas business altogether from the rates. It was no relief from a rating point of view, but simply because they could afford to do it. They were producing gas at very much less cost than formerly, as proved by the last balance-sheet; and the Council, in selling it at the lowest possible price, were only doing their duty to the consumers. As long

as they stood in their present relationship with Horbury, they could not expect to be in the same position as townships owning gas-works entirely to themselves. He meant to say that they could not expect to take great profits and hand them over in relief of the rates. Horbury had an interest in the works in the sense that they would not be satisfied to allow the price of gas to remain at a particular level, in order to allow the Ossett ratepayer to benefit by direct contribution from gas profits. He did not think that they ought to complain very much about this, because those who read municipal literature knew that Parliament had set its face more or less against creating profits in corporation trading departments in order to relieve the rates, and in several Local Acts clauses had been inserted which prevented profits from being handed over to the rates. They must sell the article produced at the lowest possible price. He was pleased Mr. Robinson had fallen in with the idea that they were doing the right thing in reducing the price of gas; and he hoped he would be able, while Chairman, to see the reserve fund full. Then he trusted that they would be in a position to make further reductions, rather than attempt to create ill-feeling between the two townships by distributing profits out of a commodity like gas.

Mr. Audsley moved, as an amendment, that the reduction should take effect on Oct. 1, instead of July 1; his view being that they would be running things rather close if the price was lowered at the earlier date. He argued that with gas at 2s. 6d., Ossett would be selling the cheapest gas in the district, notwithstanding that there were boroughs with much larger populations and consumption. It would be the worst thing they could do, to reduce the price and have to increase it again. By deferring the reduction nntil October, they would be saving a few hundred pounds, in order to tide over what he considered would be a tight corner for the next two years. Next year (1912-13), he considered would be tighter than this year, because there were certain things that the Manager (Mr. A. E. Mottram) had set his mind not to do this year, which would have to be done the following year. If the reduction was postponed until October, it would give the management a little more freedom, and it would not make a great deal of difference to the consumers, because the lighting season did not commence, for mills, &c., until then.

The amendment was not seconded. In closing the discussion,

Mr. Robinson said there was nothing to be alarmed about. They were not on the rocks; and they were not near the rocks. Neither the Manager nor the Committee was in a tight corner. There was a time coming when the neighbouring Council would be drawing something, and Ossett would be having to take something out of the rates to meet the case.

The minutes were adopted.

GAS V. ELECTRICITY FOR POWER.

Views of a Practical Engineer.

The "Manchester Courier" last Friday contained an interesting article on "Electric-Motors for Small Power Users," by a practical engineer. In the course of his opening remarks, the writer points out that when power is developed by means of a steam-engine, it is much more expensive to produce than by either gas or oil engines; while with regard to these two motors, the oil-engine gives considerably more trouble than the gas-engine, and is seldom used where gas can be bought at anything like a reasonable figure. He then proceeds to compare gas and electric engines, taking gas at 2s. 9d. per 1000 cubic feet and electricity at 1½d. per unit; and he shows that the former has a most decided advantage in the matter of cost. He furnishes the following particulars of a test lately made by a firm in the Manchester district who were considering the displacement of a gas-engine by a motor supplied with current by the Corporation.

The gas-engine was one of 11 B.H.P., and ran, on an average, 60 hours per week. Careful records were taken of the consumption of the gas, oil, and cost of attention for one month; and in the meantime cables were laid and an electric-motor installed in such a position that the driving-belt to the main shaft could be readily transferred from the gas-engine to the motor, or *vice versâ*. The works were then driven for a month by means of the motor, and careful records again taken; and it was found that when all the results had been carefully tabulated the cost of running by motor was more than twice that of the gas-engine. There were some advantages appertaining to the motor driving, but these were considerably overbalanced by the extra cost. The same experience has been met with by many other firms; and the writer says it may be declared with certainty that where power is required continuously the gas-engine is by far the cheapest machine to adopt. Coming to the cases where the power is only used at intervals, he finds very decided advantages in the use of the electric motor. One of the greatest of them lies in the ease with which the machines can be put to work. He says no previous preparation is required, and no assistance is necessary to start the motor; whereas with the gas-engine much trouble is often experienced in starting-up, and sometimes there is no one about to help to pull round the engine for starting purposes.* Besides this, the less space occupied by the motor is often of great advantage in small works.

Coming to the cost of electricity, the writer gives the following as the annual rent charged by one of the large electric power stations:

½ B.H.P.	£1 10 0	5 B.H.P.	£5 0 0
1 ,,	2 0 0	7 ,,	6 0 0
3 ,,	3 0 0	10 ,,	7 0 0
4 ,,	4 0 0		

These charges must, he says, be added to the cost per unit of electricity used in proportion to the number of hours worked. For instance, taking a case where a mortar-mill is being worked for an aggregate of 30 hours per week, taking a power of 10 B.H.P., the cost per unit of electricity will probably work out at 1d. per brake-horse-power; and taking the number of weeks worked per annum as 50, or a total of 50 by 30, equal to 1500 hours per annum, the cost will be 1500 B.H.P. hours at 1d., equal to £62 10s., *plus* £7 10s. hire rent, or a total of £70, or £1 8s. per week. Again, in the case of a small joiner's shop or cabinet-making works, in which the motor is required to drive a maximum power of 6 B.H.P., which may be needed at very irregular intervals, the total number of hours worked is difficult to estimate. But taking an actual case, the following was the cost spread over the year: Hire of motor, £6; cost of current per quarter, £2 7s. 6d.—total per quarter, £3 17s. 6d. This shows that the power must have been used for about 20 hours per week.

The writer takes another actual case of a small printing works using a 1 B.H.P. motor where the motor hire is £2 per annum and the cost for electricity 30s. per quarter; the total cost per quarter being £2. This shows that the machines have run about 40 hours per week. In this case, he says, a small gas-engine would have run at a less cost; but the extra attention required would more than balance the difference by the saving in workmen's time.

* The writer has evidently not come across the simple self-starters now applied to gas-engines which obviate all waste of time and labour in starting-up.—Ed. J.G.L.

PROPOSED MINISTRY OF LABOUR.

A Bill has been introduced by Mr. Lansbury, with the support of other Labour members, to establish a Ministry of Labour, "for the better organization of the labour market, for the prevention of unemployment, to regulate, and in certain cases prohibit, child labour, and to establish a general minimum wage for adult workers."

The proposed new Minister is to be appointed by, and hold office during the pleasure of, His Majesty the King; and he is to take the oath of allegiance and also the official oath. He is to be capable of being elected to, and of sitting in, the House of Commons, and his proposed salary is £5000 per annum. He may appoint a Secretary, Assistant-Secretary, and such other officers and servants as he, with the sanction of the Treasury, may determine. For the purpose of supervision and control, and of securing efficient and uniform treatment, he is to have all the powers and duties of the Local Government Board, the Board of Trade, or any other Government Department relating to, or concerned in, the prevention of destitution among, or the relief of, the able-bodied poor, including workmen in distress from unemployment, and vagrants. Clause 2 of the Bill specifies as follows:

In order, as far as may be practicable, to maintain at an approximately uniform level the national aggregate demand for labour, the Minister for Labour, acting in consultation with Departmental Committees to be appointed in respect of the several branches of the public service ordering works or services, shall from time to time advise the Treasury in what respects, with due regard to the efficiency of the various services, such works or services may be either delayed or hastened in order to regularize the demand for employment as between the different seasons of the year and as between the good and bad years of a trade cycle.

The new Minister is to be *ex officio* a Development Commissioner and a member of the Road Board. He is to organize his department into six or such other number of divisions as he may determine, for each of which one of the Assistant-Secretaries is to usually act. The divisions at the outset are to be: The National Labour Exchange; the Trade Insurance Division; the Industrial Regulation Division; the Statistical Division; the Emigration and Immigration Division; and the Maintenance and Training Division.

There are to be transferred to the Minister all the property, powers, rights, liabilities, and duties invested in, or imposed upon, the Board of Trade by the Labour Exchanges Act, 1909, and by certain sections of the Merchant Shipping Act, 1894; and he is to establish and maintain a National Labour Exchange, with such branches and divisions as he may think fit. He is to make, and from time to time amend, orders for the regulation of that Exchange, and the branches, officers, and advisory local committees thereof, so as to enable it, as far as may be possible, "to afford facilities for persons seeking situations by informing them what situations are vacant and in what towns, and by obtaining information concerning vacancies from employers of labour in all parts of the country; to ascertain what demands are occurring or likely to occur for particular kinds of labour, and to afford facilities to enable persons to keep in continuous employment by informing them in advance of such demands for labour; and to secure, by the arrangement of occupations, as far as possible, continuous employment throughout the year for all persons employed."

There are to be transferred to the Minister all the powers and duties of the Board of Trade relating to the regulation of the hours and conditions of labour conferred upon them by the following Acts: Boilers Explosion Acts, 1882 and 1900; Railway Regulation Act, 1893; Merchant Shipping Act, 1894 (sections 246 to 250); Notice of Accidents Act, 1894; Conciliation Act, 1896; Railways Employment Act, 1900; Trade Boards Act, 1909; Labour Exchanges Act, 1909; likewise all the powers and duties of a Secretary of State relating to the regulation of the hours and conditions of labour conferred upon him by the Factory and Workshop Acts, 1901 to 1907; the Coal Mines Regulation Acts, 1887 to 1908; the Shop Hours Acts, 1892 to 1899; the Truck Acts, 1837 and 1887; and the Aliens Act, 1905 (except section 3).

Part II. of the Bill deals with the prohibition of juvenile labour, and Part III. with the minimum wage. With regard to the latter, it is specified that the powers and duties of the Board of Trade under the Trade Boards Act, 1909, transferred to the new Minister, shall extend, without Provisional Order, to all employments in which, in his opinion, the minimum rate of wages (whether time or piece rate), ascertained as in that Act provided, does not exceed 30s. per week for every person who is 21 years of age or over; and every such employment is to be deemed to be included in the schedule to the Trade Boards Act, 1909.

It is proposed that the Act shall come into operation on Jan. 1, 1912.

In the abstract of accounts of the Borough of Doncaster, which has just been issued, the profits on the gas-works for the year to March 31 show a reduction as compared with the previous year—the figures being £4695, against £6158. The loss on the water-works, at £3105, is nearly £200 less than in 1909-10.

METROPOLITAN WATER BOARD.

Quality and Price of Water.

At the Meeting of the Metropolitan Water Board last Friday week, the annual report of the Director of Water Examination (Dr. A. C. Houston), containing detailed information relating to the chemical and bacteriological examination of the water supplied to London in the twelve months ended the 31st of March, was submitted as an appendix to the report of the Water Examination Committee.

In the course of his report, Dr. Houston stated that chemically the raw Thames (except as regards the ammoniacal and albuminoid nitrogen tests), Lea, and New River (except as regards colour) waters yielded better results in the year covered than in 1909-10. Generally speaking, the filtered waters, as judged by the albuminoid nitrogen, permanganate, and colour tests, were better in 1910-11 than in 1909-10. Bacteriologically the raw waters contained fewer bacteria last year, as compared with 1909-10. The bacteria growing in agar and bile-salt agar at 37° C. were also fewer during the period under review. The *B. coli* results were also less unsatisfactory. As regards the filtered waters, the results were very similar in 1910-11 to those of 1909-10. Dr. Houston offers the following remarks on the water as finally delivered to the consumers :—

Six years' work on the London Water Question has convinced me that to a progressively increasing extent the Water Board are seeking to secure the reasonable, if not absolute, "safety" of the Metropolitan Water Supply. The loss of the unrestricted right to abstract 130 million gallons, fixing the minimum flow at 170 million gallons, and including the gravel water in the flow of the river, are, however, factors which, if carried into effect, militate against the abstraction, under all conditions, of the best water for storage purposes. This opinion will carry the more weight since I have been, and still remain, a somewhat merciless critic of any imperfections in the processes of water purification. As a counsel of perfection, I still feel bound to advocate the choice of an initially pure source of water supply. Nevertheless, my own results and experiments do seem to indicate clearly that the evil effects even of an impure source can be largely, if not entirely, annulled by adequate storage and efficient filtration.

Dr. Houston urges that the prospective security of London, as regards its water supply, should not be based, or only to a limited extent, on past comparative immunity from water-borne diseases. He says the aim now should be to abstract raw river water as judiciously as possible, to store it for as long a period as can be done, and to filter it as perfectly as is reasonably practicable. His final opinion is that the "quality policy" of the Metropolitan Water Board should be directed towards securing an "epidemiologically sterile" water—*i.e.*, a water containing none of the microbes associated with water-borne epidemic disease—antecedent to filtration by storage (sedimentation, devitalization, and equalization), aided, if needs be, by occasional employment of supplementary processes of water purification.

Mr. C. E. Fox, the Chairman of the Committee, in moving the adoption of their report, said the Board had 7 million consumers, and yet only six or seven severe complaints had been received each month. The whole of London should know the great care that was taken in the examination of its water supply. The Board had a large staff of competent scientists whose excellent work could not fail to establish a feeling of security.

The report was adopted.

Mr. Fitzroy Doll raised the question of the Board's charges for water. He proposed that the Appeal and Amendment Committee should be instructed to bring up a report upon the working of the Charges Act, and to suggest such amendments as would have the effect of remedying the inequalities of the Act which are the cause of so much discontent. He said the Board were facing a deficit, and as business men they should meet it. The only way to do this was to amend the Charges Act in such a way that they would cease to be the "most unpopular public body in the whole of the British Empire." The first cause of their unpopularity was that their charges were unjust, and particularly to the central portions of London. The result was that the Board were experiencing great loss through the sinking of numerous wells, one of which in Holborn would mean a difference of £1500 a year.

Mr. A. H. Tozer, the Chairman of the Finance Committee, could not agree that the Board's charges, generally speaking, were unjust; and he thought it would be a misfortune if the Board passed a resolution which by implication would give consumers cause for much discontent. A large number had had their rates materially reduced in consequence of the Charges Act. The Board had nothing to do with the altering of the Act; but he thought it would be an advantage if the Committee, in their inquiries, ascertained if it were possible to capture some of those friends of Mr. Doll who sank wells, and who had all the advantages of a water supply (with a consequent reduction of their fire insurance premiums) and escaped free.

After further discussion, the resolution was lost by 15 votes to 7.

LIVERPOOL CORPORATION WATER SUPPLY.

Annual Report of the Engineer-in-Chief.

We have received from the Engineer-in-Chief of the Water Department of the Liverpool Corporation (Mr. Joseph Parry, M.Inst.C.E.) a copy of his twelfth annual report, covering the year ended the 31st of December last. He states that the principal event was the completion of the head works at Lake Vyrnwy, by the diversion into the reservoir of the Rivers Cownwy and Marchnant. Particulars of these works have already been given in the "JOURNAL." On the 16th of March, 1910, His Royal Highness the Prince of Wales, now His Majesty King George V., visited the lake, turned on to the Marchnant supply, and unveiled a tablet recording the completion of the entire undertaking so far as regards the works at and around Lake Vyrnwy. As explained by Mr. Parry in former reports, the scheme, as originally designed, was estimated to provide, even in periods of extreme drought, an average daily supply for Liverpool of 40 million gallons, in addition to the compensation water to the river, amounting to 13½ million

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 223.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82—85	..	5 17 8
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93—95*	..	4 4 3
200,000	5	May 12	7	Bombay, Ltd.	6¼—6⅜	..	5 3 8
40,000	5	,,	7	Do. New, £4 paid	5¼—5⅜	..	4 17 5
50,000	10	Feb. 24	15	Bourne-) 10 p.c.	28½—29½	..	5 1 8
311,810	10	,,	7	mouth Gas) B 7 p.c.	16⅝—16⅞	..	4 3 0
75,000	10	,,	6	and Water) Pref. 6 p.c.	14⅛—15	..	4 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	257—262	..	4 15 5
330,000	,,	,,	9½	Do. New	200—210	..	4 10 6
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	June 15	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217—220	..	5 0 0
246,320	,,	,,	8	Do. A Ord. Stk.	157—160	..	5 0 0
490,000	20	Apl. 12	11⅞	British	44½—45½	..	5 3 5
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94—96	..	4 3 4
109,000	,,	Feb. 10	6	Bromley, A 5 p.c.	116—118	..	5 1 8
165,700	,,	,,	4½	Do. B 3½ p.c.	87—89	..	5 1 2
82,278	,,	,,	5½	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	June 30	3½	Do. 3½ p.c. Deb.	82—84	..	4 3 4
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80—83	..	5 8 5
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,513,280	Stk.	,,	5/9/4	Commercial 4 p.c. Stk.	114—116	..	4 14 3
560,000	,,	,,	5½	Do. 3½ p.c. do.	108—110	..	4 16 11
475,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	75½—77½	..	3 17 5
800,000	Stk.	May 31	4	Continental Union, Ltd.	91—94	−1	4 5 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—137	..	5 2 2
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
148,995	,,	Apl. 12	5	East Hull 5 p.c. Ord.	—	..	—
840,150	10	Jan. 27	10	European, Ltd.	19—20	..	5 0 0
16,179,445	Stk.	Feb. 24	4/14/8†	Gas-) 4 p.c. Ord.	107—108	+½	4 7 8
2,600,000	,,	,,	3½	light) 3½ p.c. max.	85—87	..	4 0 6
4,062,235	,,	,,	4	and) 4 p.c. Con. Pref.	103—105	..	3 16 2
4,531,705	,,	June 15	3	Coke) 3 p.c. Con. Deb.	78½—80½	..	3 14 6
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95—97	..	5 3 1
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½—18	..	6 2 2
131,000	Stk.	Mar. 10	7⅜	Ilford A and C	147—150	..	4 18 4
65,780	,,	,,	5⅜	Do. B	119—122	..	4 16 3
65,500	,,	June 30	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
4,940,000	Stk.	May 12	9	Imperial Continental	183—185	−½	4 17 3
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4
561,000	Stk.	Feb. 24	10	Liverpool United A.	215—217	..	4 12 2
718,100	,,	,,	7	Do. B.	163—165	..	4 4 10
306,083	,,	June 30	4	Do. Deb. Stk.	102—104	..	3 16 11
75,000	5	June 15	6	Malta & Mediterranean	4⅛—4⅜	..	6 3 1
560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 31	3½	Monte Video, Ltd.	12⅝—13⅛	..	5 5 8
1,775,892	Stk.	Feb. 24	4½	Newc'tle&G'tesh'd Con.	103½—104½	..	4 3 9
529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87—89	..	3 18 8
55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15—16	..	4 7 6
300,000	Stk.	Apl. 27	8	Oriental, Ltd.	137—139	..	5 15 1
60,000	5	Apl. 12	8	Ottoman, Ltd.	6⅜—7⅛	..	5 10 4
31,800	53	Feb. 24	13	Portsea Island A	135—140	..	4 18 4
60,000	50	,,	13	Do. B	—	..	—
100,000	50	,,	12	Do. C	120—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	—	..	—
398,490	5	May 31	8	Primitiva Ord.	7⅜—7⅝	..	5 3 3
796,980	5	June 30	5	Do. 5 p.c. Pref.	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Mar. 24	9	San Paulo, Ltd.	21½—22½	..	4 0 0
115,000	10	,,	6	Do. 6 p.c. Pref.	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49½—50½	+½	4 19 0
135,000	Stk.	Mar. 24	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	236—238	..	4 4 0
523,500	,,	,,	10	Do. C	236—238	..	4 4 0
70,000	10	June 15	7	South African	8½—9½	..	7 7 4
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	78½—80½*	..	3 14 6
209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Feb. 24	5⅜	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 13 6
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	121—123*	..	4 1 4
502,310	Stk.	May 12	5	Southampton Ord.	107—109	−2	4 11 9
120,000	Stk.	Feb. 10	7½†	Tottenham) A 5 p.c.	147—150	..	4 15 0
483,940	,,	,,	5⅝†	and) B 3½ p.c.	116½—118½	..	4 15 0
149,470	,,	June 15	4	Edmonton) 4 p.c. Deb.	96—98	..	4 1 8
182,380	10	June 15	8	Tuscan, Ltd.	8⅞—9¼	..	8 13 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115—117	..	4 5 6
255,636	Stk.	Feb. 24	6¾	Wands-) B 3½ p.c.	141—143	..	4 14 5
85,766	,,	June 30	3	worth) 3 p.c. Deb. Stk.	71—73	..	4 2 2

Prices marked * are "Ex. div." † Next dividend will be at this rate.

gallons per day. He says it is satisfactory to know that these expectations have been more than realized. The rainfall has exceeded the first calculations; and the storage provided by the Corporation in the lake having been on an unusually liberal scale, there will be considerably more water available than was foretold.

Closely connected with the question of the amount of water available is that of the financial position of the undertaking, which is the next matter dealt with by the Engineer. He shows that the total income of the undertaking (excluding the Chorley works) for the past year was £360,115. The payments during the same period included the following amounts, which are in the nature of fixed charges, and are quite independent of the working expenses over which the Committee have control: For interest on capital borrowed, £205,279; expenses of stock, £3471; sinking funds set aside under the provisions of the Water Acts, £35,749; rates and taxes, £39,351—making a total of £283,850, and leaving a net balance of £76,265 for working expenses. The last amount is equal to 1½d. per 1000 gallons on the quantity of water distributed. The chief sources of revenue are: The fixed water-rate of 6d. in the pound; the domestic water-rents; the supplies by meter for trade purposes; and the supplies to ships. The maximum domestic water-rents, the water-rate, and the charges for shipping supplies are all fixed by Parliament, and cannot be exceeded without further statutory powers. The supplies for all other purposes are subject to agreement; and the scales from time to time adopted for trade and miscellaneous purposes have been so arranged as to distribute equitably the amount to be raised between all classes of consumers, domestic and trade, making due allowance for the quantities consumed and the conditions of distribution.

The total expenditure on revenue account last year (excluding Chorley) was £359,640; and the total water supplied during the year (exclusive of Chorley) was 11,836,305,000 gallons. The average cost of water for the year was, therefore, 7·29d. per 1000 gallons. The trade consumer, whose supply is measured through meter at 6d. per 1000 gallons, pays less than the average cost price; but Mr. Parry points out that when his contribution to the water-rate is taken into account, his position in relation to the revenue of the water undertaking is approximately the same as that of the domestic consumer. How few people, he says, realize the extraordinary cheapness of the water supply. Collected at its upland source in vast reservoirs, filtered through an elaborate system of filter-beds, conveyed by aqueducts across the country for a distance (in the case of the Vyrnwy water) of 75 miles, it is delivered to consumers in the city for less than 1½d. per ton. Any loss of revenue brought about by selling water for trade purposes at a lower rate would have to be made good by the domestic consumers, unless the reduction in price had the effect of inducing a sufficiently increased consumption to counterbalance the loss. These considerations have led the Committee at various times to consider proposals based on offering lower rates to trade consumers if, in so doing, existing revenue could be maintained.

During the past year, the average quantity of water supplied per day from the works of the Corporation was 33,164,000 gallons, and the estimated population supplied was 1,132,446. The corresponding figures for the year 1909 were: Daily consumption of water, 32,995,000 gallons; population, 1,119,933. There was, therefore, an average increase of consumption in 1910 over 1909 of 169,000 gallons per day. The maximum quantity consumed in any one day was 40,172,000 gallons in the winter season and 35,324,000 gallons in summer. The minimum daily consumption in winter was 20,132,000 gallons, and in summer 20,270,000 gallons. Besides these variations in the quantities consumed per day, provision has to be made for the fluctuating demands from hour to hour.

The total volume of water distributed during the year amounted to 12,071,683,000 gallons. This was obtained from the several sources of supply as follows: Vyrnwy, 6,509,426,000 gallons; Rivington, 4,523,352,000 gallons; wells, 1,027,299,000 gallons; and salt water, 1,606,000 gallons.

The total length of new mains laid last year in the city and suburbs was 11,787 yards; and the number of fire-hydrants fixed was 102—making the total number of hydrants in the compulsory area 15,955.

BIRKENHEAD CORPORATION WATER SUPPLY.

The New Scheme.

The preliminary work in connection with the new water supply for the Birkenhead Corporation, which involves the building of a large masonry dam across the River Alwen (a tributary of the Dee), and of a pipe-line to convey the water from the reservoir thus formed to Birkenhead, where a large service reservoir will be constructed at Cross Hill, is now being started; and, in view of this fact, the following particulars of the scheme were recently given in the Engineering Supplement to "The Times."

The dam will be situated in the parish of Cerrig-y-Druidion, in Denbighshire, at a point about 2½ miles north of the village. It will be 458 feet in length, and 92 ft. 6 in. above the bed of the stream; and it will create a reservoir fully three miles long, with a total capacity of 3000 million gallons and a top-water area of 375 acres. It is expected that the foundations for the dam will be taken to a maximum depth of 100 feet. The drainage area is about 6313 acres. Owing to the fact that at one end of the dam the surface of the ground is slightly below the level which will be reached by the crest, the dam will be continued for a length of about 450 feet by an earthen embankment with a puddle core. The height of this embankment will be about 10 feet, and the depth of the trench about 30 feet.

The dam will be constructed on a curve of 500 feet radius, and will be composed of mass concrete, except that the face on the water side,

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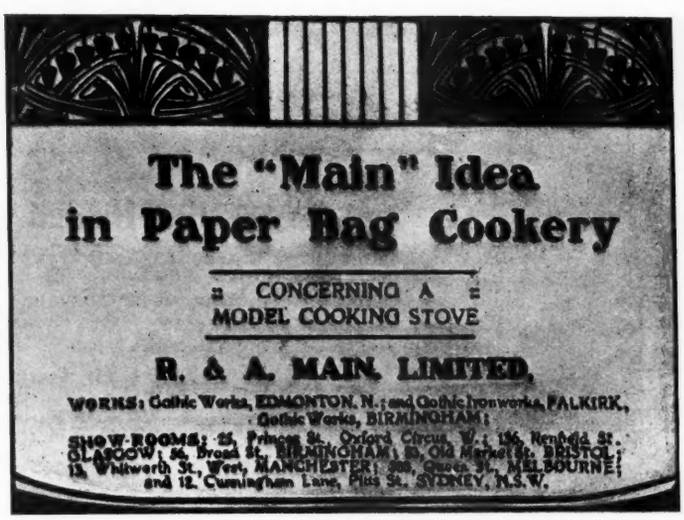
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which is vertical, will be lined with concrete blocks, and that on the down-stream side with squared rubble masonry. The widest part at the base will be 86 feet. The crest of the dam will terminate on a curve from the down-stream side; but the width within 2 feet or 3 feet below the crest is roughly 9 ft. 9 in. At a level of 7 ft. 6 in. above the crest, the dam will be surmounted by a roadway, about 10 feet in width, supported on a series of buttresses, 6 feet wide, with sixteen spans each 20 feet long. In the centre of the dam there will be an ornamental square tower extending to a height of 33 feet above the roadway, and built with an arch on each of the four sides; the roadway passing through two of these arches under the tower. The overflow will take place only on the south side of the tower, and for this purpose a concrete and masonry channel, leading to the bed of the river, is to be constructed.

The valve-shaft, 12 feet in diameter, will be immediately underneath the tower, and in it will be placed a 28-inch pipe with intakes at two levels. The compensation water will be drawn from a 42-inch scour pipe passing through a culvert and valve-house at the foot of the dam, and will lead to the usual basin on the down-stream side of the dam for measurement. The head of water above the compensation basin will be utilized to drive a small hydro-electric plant for the generation of electricity for lighting and power purposes connected with the head works of the supply.

It will be necessary to provide a protecting wall at various parts along the edge of the reservoir at high-water level for a total distance of about five miles. Two miles above the dam a small footbridge with embanked approaches will be built, in order to maintain an existing right-of-way. The abutments for this bridge will be constructed in masonry; but the superstructure will be built of concrete reinforced with steel bars, and the parapets will be employed as girders. The span of this bridge will be 59 feet; and as it is intended only for foot traffic, the width will be 3 ft. 9 in. inside the parapets.

An important part of the work in connection with the reservoir is the removal of about 1,500,000 cubic yards of peat and soil in order to overcome the risk of contamination. It is hoped to utilize a portion of this material as fuel for power purposes in connection with the construction of the dam; but the method to be adopted for the disposal of the bulk of it has not yet been finally decided. In addition to this excavation work, it is expected that the building of the dam will necessitate the removal of 18,000 cubic yards of material, and that the construction work will require about 35,000 cubic yards of concrete. The Contractors for the undertaking, so far as concerns the dam and the reservoir, are Messrs. Robert M'Alpine and Sons, and the contract time for its completion is four years from January last.

The pipe-line leading to Birkenhead will be about 43 miles in length, and it will vary between 20 and 30 inches in diameter, calculated to give an average daily supply of 7 million gallons. The water will flow entirely by gravity, as the high-water level of the reservoir will be about 1190 feet above the sea; and in order to relieve the pressure, the pipe will be broken at six points along the route by four tanks, a short tunnel, and a service reservoir. Filter-beds will be provided close to the reservoir. With the exception of the small tunnel which will be situated at Bwlch, and the crossing of the River Dee either by sinking the pipe or by making a tunnel, there is practically nothing of special interest in the construction of the pipe-line.

The preliminary estimate of the cost of the work is £1,340,000; but this figure includes the provision of a second reservoir which may ultimately become necessary in the neighbourhood of the present one, and also a second pipe-line, additional filters, and service reservoir.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This has been a busy week in Edinburgh, and indeed in Scotland; all the great ones in the land having been assembled in the capital to do homage to the Sovereign of the Realm. The city looked very pretty in her garb of decoration, though there have not been wanting some who expressed the cherished belief that as the lily needs no painting, so the "grey Metropolis of the North" requires no adventitious aid in the shape of bunting to enhance her beauty. People are welcome to differ upon this subject, and their differences will not concern us. It is another matter when illumination is taken account of. If the attempt be made to improve upon the natural beauties of Edinburgh, there is no form of beautifying which can at all compare, in effectiveness, with illumination; and there is no place within the United Kingdom which can at all compare with Edinburgh when illuminated. On this occasion, illumination was all but neglected. The circumstance would not have bestirred me to write this note were it not for the fact that the opportunity which was presented of showing what could be done by gas was, it may be said truly, lost. The Gas Commissioners had upon the front of their office in Waterloo Place a very pretty design, which was greatly admired by those who saw it; but it was seen by only a fraction of the crowds who thronged the streets. The Commissioners also showed a dozen gas-flares on the top of the large gasholder at Granton; but at that distant point the illumination was not so striking as it would have been if it had been nearer to the spectators. Messrs. J. M'Kelvie and Co., coal merchants, had several of the same species of flares on the roof of their office in Rutland Square, and these showed to great advantage. In one respect, in particular, they greatly excelled other forms of illumination, in the mobile, active form of the lighting, which told upon the vision and the imagination favourably, in contrast with the dead, fixed-point appearance which illuminated devices have in which electricity is the lighting agent. It is to be regretted that the Gas Commissioners did not do something in the way of showing what could be done by means of high-pressure gas lighting. Such an illumination, considering the many influential people who were about from all quarters, would have been

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one of the most effective publicity purposes which could well be conceived. Yet it was not taken advantage of.

In his annual report to the Corporation of Falkirk, Mr. W. Wilson, the Gas Engineer and Manager, states that the quantity of gas manufactured during the year amounted to 199,100,000 cubic feet—an increase, when compared with the previous year, of 2,730,000 cubic feet. The gas sent out amounted to 198,880,000 cubic feet—an increase of 2,091,300 cubic feet, equal to 1·06 per cent. The gas accounted for amounted to 173,410,800—an increase of 1,430,000 cubic feet. Gas unaccounted for amounted to 25,689,200 cubic feet, which was equal to 12·89 per cent., as compared with 12·42 per cent. in the year preceding. There were 21,632 tons of coal carbonized, as compared with 21,380 tons. The average yield of gas per ton of coal carbonized was 9204, as compared with 9184 cubic feet. The coke and breeze made, exclusive of that which was used for heating retorts and firing boilers, was 12,572 tons, as compared with 12,231 tons. This was equal to 11·62 cwt. per ton of coal carbonized, against 11·44 cwt. in the year previous. The tar and liquor made amounted to 1,016,676 gallons—an increase of 99,316 gallons, and was equal to 46·99 gallons per ton of coal carbonized. For purification there were used 60 tons of lime and 261 tons of oxide of iron, as compared with 604 tons of lime in the preceding year, when lime only was used. Of benzol, 15,372 gallons were employed, as compared with 32,912 gallons. During the year, there was an increase of 830 cookers in use; the total number now being 2976. There were 73 new services connected, and 67 old ones renewed. There was a decrease of 169 in ordinary consumers, and an increase of 304 prepayment consumers—a net increase of 135. The total number of consumers at May 15 last was 9570, consisting of 4611 ordinary and 4959 prepayment. There were no extensions of mains during the year; but 520 yards were renewed or enlarged.

The gas-works at Gatehouse, on the shores of the Solway Firth (an unlisted undertaking), are for sale. The shareholders have resolved to dispose of them as a going concern; and, it is said, "in order to simplify the transaction, the Gas Manager has received notice that his services will not be required after three months from date."

Mr. J. Dickson, who a little more than a year ago was appointed Engineer and Manager of the Forfar Corporation Gas-Works, has done excellent work since he went there. The report which he has submitted to the Corporation is a record of successful working, both in the works and in finance. He states that the year ending May 15, 1910, closed with a credit balance of £56, which was carried into the contingent fund, in addition to the statutory sum of not less than 2½ per cent. of the annual gross revenue. The disposal of the balance in this way left the financial year just ended to start without an accrued balance being brought into the account. It was pleasing to note that all the items on the income side of revenue showed increase over the estimates. The sale of gas was estimated to produce £5878; the actual sale had amounted to £6391—an increase of £513. Coke sales showed an increase of £19, tar and liquor sales of £54, furnishings sold during the year of £114, and stove hires of £12 over the estimates. The price of gas to ordinary consumers was the same as in the previous year; but a reduction of 3d. per 1000 cubic feet was made to prepayment consumers, and the result of this was manifest in the total sale of gas to that class of consumers having risen from 999,400 cubic feet to 1,947,700 cubic feet—almost double the consumption. Coke prices rose slightly, and the average price received over the year was 9s. 5·37d. The market for tar and liquor also improved, and the average price per 100 gallons was 5s. 3·82d. The total income was £8435—an increase of £712 over the estimate, and of £747 over the income of the previous year. The total expenditure was £6534—a decrease of £48 upon the estimate, and of £106 upon the previous year. Better carbonizing results and a reduction in the price of coal resulted in an extra income of £572 from the sale of gas being obtained from a reduced expenditure of £213 on coal—the actual expenditure thereon being £64 under the estimate. Purification cost £22 more, on account of new parcels of oxide of iron being bought; but this had been more than compensated for in the lessened number of changes of purifiers. The cost of labour amounted to £980, as compared with £991 the previous year. The stove account was higher than in any previous year; but he considered this one of the most satisfactory features of the accounts. The total income, inclusive of gas, 3s. 1·75d., coke and tar, 10·74d., and furnishings and stove hires, 1·33d., was equal to 4s. 1·82d. per 1000 cubic feet of gas sold, and the total expenditure to 3s. 2·59d. The gross profit was £1900—equal to 11·23d. per 1000 cubic feet of gas sold. Annuities, interest, sinking, and contingent fund charges amounted to £1075—equal to 6·36d.; and the net profit—£825—equalled 4·87d. per 1000 cubic feet sold. It was gratifying to be able to report an increased make of gas of 3,397,800 cubic feet, and an increased sale of 3,600,700 cubic feet. Coal carbonized to produce 45,507,300 cubic feet of gas amounted to 4908 tons—an increase of only nine tons; the make of gas per ton of coal having risen from 8596 to 9272 cubic feet. Coke sold amounted to 2653 tons—equal to 10·81 cwt. per ton of coal carbonized. The total quantity of tar and liquor sold amounted to 240,770 gallons—equivalent to 49·05 gallons per ton of coal carbonized. The percentage of gas lost dropped from 12·1 to 10·7; but the latter figure did not fairly represent gas unaccounted for, as the gas used on the works had now for the first time been registered, as a result of which 3,996,000 cubic feet fell to be added to gas accounted for, bringing the figure down to 9·84 per cent. Contracts for the supply of coal for this year have been entered into at a cost of 9d. per ton less than last year's price, representing a saving on the current year's working of about £190. The erection of sulphate of ammonia plant is nearing completion; and a start will be made with it early in August. The accounts, it may here be remarked, have not yet been considered by the Town Council.

The Kinghorn Gas Company have reduced the price of gas from 5s. to 4s. 7d. per 1000 cubic feet.

At the annual meeting of the Montrose Gaslight Company, the report of Mr. A. Mackay, the Manager, stated that the Company had made satisfactory progress throughout the year. The quantity of gas made

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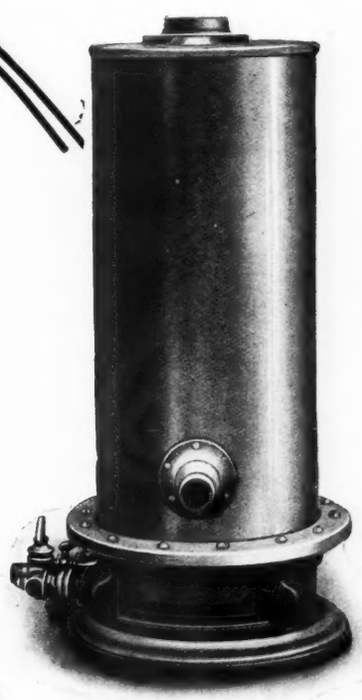
CARRON, STIRLINGSHIRE.



was 32,910,000 cubic feet, and the amount sold showed an increase of 215,000 cubic feet, as compared with the previous year. The balance-sheet showed a profit of £1270, after deductions had been made for depreciation. A dividend at the rate of £2 12s. 6d. was declared; and the Chairman intimated that, so far as could be seen, the Board would be able to make a reduction in the price of gas.

The Brechin Gas Company, Limited, held their annual meeting on Friday, presided over by Mr. James Guthrie, J.P., who, in moving the adoption of the report of the Directors, said that the Company was never in a better position than it was now. The capital account had been reduced by £400. They were very favourably placed in regard to their coal contracts for the year, and they therefore thought that they could afford to reduce the price of gas by 2d. per 1000 cubic feet, as well as to pay a higher dividend. With regard to the proposed purchase of the gas-works, some were favourable to the purchase, and others were against it. Of course, they were open to consider an offer. This was only business. The report was adopted, and the proposed reduction in the price of gas and the declaration of a dividend of 8½ per cent. were agreed to.

Last night, a special meeting was held of the Aberdeen branch of the Gas Workers' and General Labourers' Union, at which a circular from the General Labourers' National Council was submitted, the burden of which was that there was a feeling that the unions of lesser skilled workmen should be brought together in one amalgamated union. The Aberdeen branch unanimously resolved to support amalgamation. Probably the branch consists of only a few men, and, except upon paper, their support of anything will be of little consequence; so the consumers of gas in Aberdeen, it may safely be assumed, should be able, notwithstanding this portentous resolution, to continue to "sleep o' nights."

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 254.]

LIVERPOOL, *July* 22.

Sulphate of Ammonia.

There has been a strong tone in the market throughout the week, and although practically no quotable increase in values for near delivery has to be recorded, manufacturers have not found any difficulty in disposing of their present output at very full prices. Other large consuming countries than the United States have been showing more interest than has lately been the case, and the closing quotations are well maintained at £13 12s. 6d. per ton f.o.b. Hull, £13 13s. 9d. per ton f.o.b. Liverpool, and £13 15s. per ton f.o.b. Leith. The forward position has been even firmer than that for early shipment, and £13 17s. 6d. per ton f.o.b. Leith is said to have been paid right through from the present month to June next year, while producers generally are now asking £14 per ton for any further quantity.

Nitrate of Soda.

The situation of this article remains unchanged, and 10s. per cwt. for ordinary and 10s. 3d. for refined quality are still the prices required on spot.

LONDON, *July* 24.

Tar Products.

Markets still continue firm, although there is not a great volume of new business. Pitch shows an upward tendency, and distillers on the whole are very firm in their ideas. Benzols are quiet but steady, and makers still continue to ask high prices. Solvent naphtha is quiet, and business is difficult to negotiate. Heavy naphtha is in fair demand, and the price keeps very steady. There is a fairly good demand for creosote, and one or two fair sized contracts have recently been placed. Crude carbolic acid is in continual inquiry, and distillers are, in most cases, asking high prices.

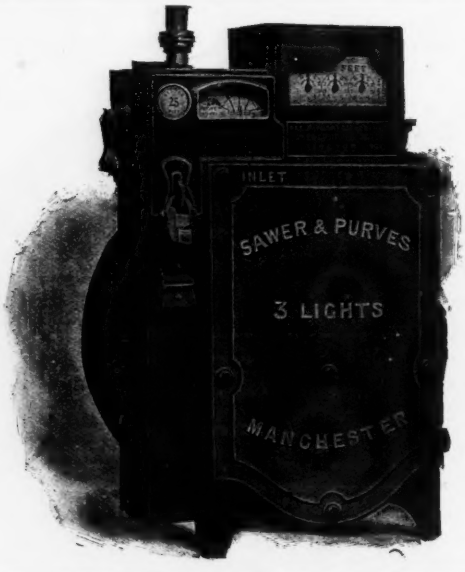
The average values during the week were: Tar, 19s. 3d. to 22s. 3d., *ex* works. Pitch, London, 38s. 6d. to 39s.; east coast, 38s. to 38s. 6d.; west coast, Manchester, 37s. 6d. to 38s., Liverpool, 38s. to 38s. 6d., Clyde, 38s. to 38s. 3d. Benzol, 90 per cent., casks included, London, 9d. to 9¼d.; North, 9d.; 50-90 per cent., casks included, London, 8¾d. to 9¼d.; North, 8½d. to 9d. Toluol, casks included, London, 9¾d. to 10d.; North, 9½d. to 9¾d. Crude naphtha, in bulk, London, 4d. to 4¼d.; North, 3¾d. to 3¾d.; solvent naphtha, casks included, London, 11d. to 11¾d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11¼d. to 1s. 0¾d.; North, 10d. to 10¾d. Creosote, in bulk, London, 2⅞d. to 2¾d.; North, 1¾d. to 2d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 11d.; west coast, 1s. 10d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1¼d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been renewed activity in the market during the past week, and large quantities have been sold at improved prices. The one outstanding feature is the amount which is being sold for delivery right up to the end of June next. Actual Beckton as quoted to-day is £13 10s. to £13 12s. 6d., outside London makes on Beckton terms £13 10s., Leith £13 17s. 6d. to £13 18s. 9d., Hull, £13 13s. 9d. to £13 15s., Liverpool £13 17s. 6d., and Middlesbrough £13 13s. 9d. For the forward position, 1s. 3d. to 2s. 6d. premium is asked.

Messrs. John Russell and Co., Limited, of the Alma Tube Works, Walsall, have forwarded a copy of a new general catalogue of tubes and fittings which they have just issued; and they draw attention to the noteworthy fact that the publishing of this book marks the centenary of their existence as a firm of tube makers. The catalogue (which is of a handy size) contains full particulars of all kinds of tubes and fittings in wrought iron and steel; and, in addition, there are included a number of interesting and valuable tables and data which are likely to prove useful to gas and water engineers.

PREPAYMENT METERS



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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade in the North-east has been in some measure influenced by the labour unrest and the prospects of a stoppage in Northumberland. Best steam coals are in consequence higher at about 11s. 6d. to 11s. 9d. per ton f.o.b.; but these are nominal prices, as there is so little coal free for early sale. Second-class steams are from 9s. 3d. to 9s. 6d. per ton; and steam smalls from 5s. to 6s. per ton. There is a full output of steam coals, which is well taken up, especially for export; some steamers having apparently been diverted from Wales to this district. In the gas coal trade, the demand is very full for this season, and the tendency of prices is generally firm. Second-class Durham coals are 9s. 3d. to 9s. 6d. per ton f.o.b., best Durhams are well taken-up, and are quoted from 10s. 3d. to 10s. 4½d., and "special Wears" are from about 10s. 9d. to 10s. 10½d. There have been sales of gas coals in cargoes for Genoa at about 16s. 3d. and 16s. 6d. per ton, according to quality, delivered at the port named; and there have been one or two contracts fixed for delivery over the rest of this year, at somewhat similar prices, if quality be considered. Other contracts for next year are in the market; but the coalowners seem to desire higher prices, as the cost of production is increasing. The coke trade is steadier. Good gas coke is a little more plentiful, and is quoted at about 14s. 3d. per ton f.o.b., but with some variation, according to the position of the gas-works in regard to contracts.

Scotch Coal Trade.

There is no market to record, on account of last week having been the holiday week in the west of Scotland. The shipments recorded amounted to 329,102 tons—an increase upon the previous week of 4077 tons; but a decrease upon the corresponding week of 16,810 tons. For the year to date, the total shipments have been 8,592,613 tons—a decrease upon the corresponding period of 29,324 tons.

Fylde Water-Works Jubilee.—Mr. C. Arthur, the Secretary to the Fylde Water Board, has, in commemoration of the jubilee of the undertaking, written and published a volume on its history. When the Fylde Water-Works were first contemplated, there were less than 3000 houses to provide for—viz., 776 in Blackpool, 660 in Kirkham, 542 in Fleetwood, and 391 in Lytham and St. Anne's-on-the-Sea. A scheme formulated in 1853 had to be dropped for lack of pecuniary support. But the next was more successful; and on July 22, 1861, the Royal Assent was given to the Fylde Water-Works Act. The first reservoir was constructed at Grizedale, near Garstang; and in 1899 the undertaking was acquired by the Local Authorities of Blackpool, Fleetwood, Lytham, and St. Anne's—the purchase price being £765,455. Originally mains were laid to provide a supply of 750,000 gallons of water per day. The daily consumption is now about 6 millions; and such has been the increase of late that, as mentioned last week, the Board are seeking for a fresh source of supply.

Shanklin Water Supply.—The new water-works at Chillerton (Isle of Wight) for the supply of Shanklin were informally opened last Wednesday. One of the engines is specially intended to pump water through the Shanklin mains; the estimated quantity being 25,000 gallons per hour. The new scheme will relieve for a time the anxieties of the residents of Shanklin as to their water supply.

Incandescent Gas Lighting in Cardiff.—Mr. W. Harpur, the City Engineer, has reported to the Cardiff Tramways and Electricity Committee that the total cost of the conversion by his department of 1160 gas-lamps from flat-flame burners to the incandescent system was £1956, which was about £500 less than the Gas Company's tender, and £150 lower than his own estimate. The work had been carried out well, and in good time. The Committee expressed satisfaction with the result, and granted Mr. Irwin, the Superintendent of Street Lighting, who had had charge of the work, an honorarium.

Costs of Opposing the Standard Burner Bills.—At a meeting of the Exeter City Council last Wednesday, the Town Clerk (Mr. H. Lloyd Parry) submitted two bills of costs from the Council's Parliamentary Agents in respect of the Standard Burner Bill—one for £39 10s. 8d. in connection with the opposition to the Bill before the House of Lords, and the other for £38 14s. 9d., the opposition before the House of Commons. The Agents had been induced, upon representations made to them, to accept £40 in payment of the total amount of £78 5s. 5d. It was explained that the Bill for the Council apportionment of the joint costs had not yet come to hand.

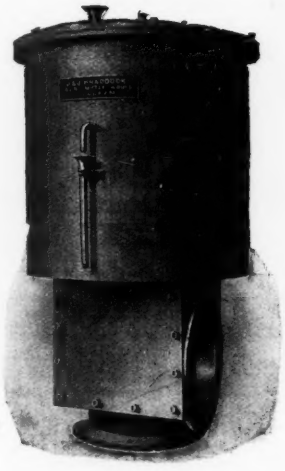
Electric Main Extensions at Hastings.—In the course of a Local Government Board inquiry held at Hastings a few days ago by Mr. H. Shelford Bidwell, M.Inst.C.E., opportunity was taken by the Corporation to apply for authority to borrow money for the extension of their electric light mains. It appears that no public advertisement of this was made; the notice given being in respect of sewerage work, private street improvements, and a concrete groyne. This is an ingenious way of raising more money. However, in the course of the inquiry the fact came out that the deficit on the electricity undertaking is being reduced, and it is hoped to be cleared off this year.

Aldershot Gas, Water, and District Lighting Company.—At the next half-yearly meeting of this Company, the Directors will report that the total revenue in the six months ended the 30th of June was £32,505, and the expenditure £23,013; leaving a surplus of £9492. After providing for dividend on the consolidated preference stock and interest on mortgage and debentures, the Directors recommend dividends for the half year at the rates of £6 1s. per cent. per annum on the "A" stock, £4 11s. per cent. per annum on the "B" stock (these rates being in accordance with the sliding-scale), and £5 per cent. per annum on the "C" consolidated stock—all less income-tax. Exclusive of works and War Department supplies, the sales of gas increased 10·54 per cent. The revenue from water was higher, and the market for residuals improved. Generally, the half-year's results were satisfactory. At the close of the business at the ordinary meeting, the shareholders will be asked to authorize an issue of additional capital.

BRADDOCK'S

RETORT-HOUSE

GOVERNORS.



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Braddock's Enclosed Retort-House Governor, with Internal Float.

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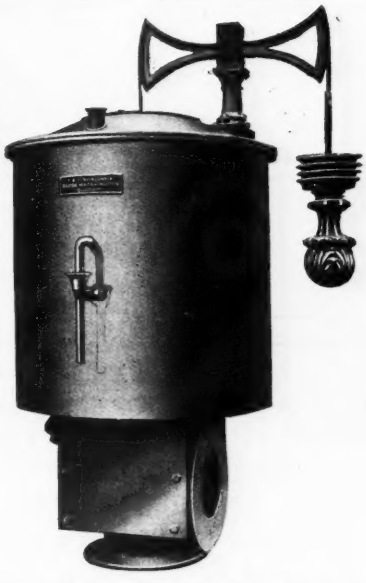

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Local Authorities and the Acquisition of Water.—The text has been published of a Bill introduced by Mr. Herbert Lewis, and supported by the President of the Local Government Board, to enable the Board, by Provisional Order, to give powers to local authorities for the purpose of the acquisition of water. The Bill stipulates that provision shall be made by every Provisional Order for compensation being given in respect of the abstraction of water under the Order. The compensation is to be given, if practicable, by means of the supply of a flow of water; and, if not so practicable, in such manner, either by means of a payment of money or otherwise, as the Order directs. A Provisional Order may provide for all matters which appear to the Board necessary or proper for bringing into operation and giving full effect to the Order.

Among the new registrations is the Tintwistle Water-Works Company (1911), Limited. It is limited by guarantee.

The National Gas-Engine Company, Limited, of Ashton-under-Lyne, has just been re-registered with a capital of £1,000,000, in £1 shares, of which 400,000 are 5 per cent. cumulative preference.

The annual outing of the Wolverhampton Gas Company Fittings Department took place last Saturday week; the destination being Portsmouth. The party were entertained at dinner by the Directors and Engineer of the Company. After the loyal toast, the Chairman (Mr. A. Coombe) proposed "Success to the Gas Company," coupled with the name of Mr. P. G. Winstanley, the Engineer; and this was heartily received.

The Directors of the Tottenham and Edmonton Gas Company, after placing £2000 to the renewal fund and £1000 to the insurance fund, recommend payment for the past half year of the full statutory dividends of $7\frac{1}{8}$ per cent. per annum on the "A" stock, and $5\frac{5}{8}$ per cent. per annum on the "B" stock; carrying forward £28,648. A year ago the dividends were at the rate of 7 and $5\frac{1}{2}$ per cent. respectively, and the carry-forward was £23,154.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

TRAVELLER (TOOLS, &c.). Taylor and Bryden, Billiter Street, E.C.
TRAVELLERS (MANTLES). 535, c/o T. B. Browne's Advertising Offices.
COLLECTOR (WATER). Applications to Mr. B. D. Holroyd, 6, Great Winchester Street, E.C.
GENERAL FOREMAN. No. 5428. Applications by July 27.
SHOW-ROOM ATTENDENT. No. 5432.
METER REPAIRER. Derby Gas Company.
RETORT SETTER AND BUILDER. Box 2903, Burton's, Aldwych.
STOKER. No. 5426.
STOKER. Ynyscynhaiarn Urban District Council. Applications by Aug. 1.

Appointments Wanted.

MANAGER. No. 5430.
POSITION OF TRUST. (Gas Undertaking or Gas Appliances Works.) No. 5431.

Plant, &c., for Disposal.

COMPLETE SULPHATE OF AMMONIA PLANT, &c. (Park Chemical Company, in Liquidation). By Auction. Particulars of the Auctioneer, 21, Mawdsley Street, Bolton.

Plant &c., for Disposal *Continued.*

CONDENSER. Sutton Gas Company.
LAMPS. West Bromwich Gas-Works.
METERS. No. 5424.
TAR-WORKS. No. 5427.

Gas-Works Wanted (Purchase or Lease).

No. 5429.

Patents, Licences, &c.

ACETYLENE LAMPS AND GENERATORS, &c. Haseltine, Lake and Co., Southampton Buildings, W.C.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel. Aug. 2. Twelve o'clock.
BROMLEY AND CRAYS GAS COMPANY. Bell Hotel, Bromley. Aug. 3. Six o'clock.
GASLIGHT AND COKE COMPANY. Offices. Aug. 4. Twelve o'clock.
HORLEY GAS COMPANY. Offices. Aug. 10. 3.30 o'clock.
SOUTH SUBURBAN GAS COMPANY. Works. Aug. 4. 2.30 o'clock.
TOTTENHAM GAS COMPANY. Works. Aug. 5. Three o'clock.

Stocks and Shares.

HARPENDEN DISTRICT GAS COMPANY. Applications by Aug. 5.
HORLEY GAS COMPANY. By Tender.

TENDERS FOR

Coal and Cannel.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by Aug. 5.
SHEFFIELD UNITED GASLIGHT COMPANY. Tenders by Aug. 1.
STRATFORD-ON-AVON GAS COMMITTEE. Tenders by Aug. 12.

Oxide.

MIDDLETON CORPORATION. Tenders by Aug. 5.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 22. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	28/- 30/-	20/- 24/-	24/-	20/- 22/-	20/- 22/-	—
Pitch	„	40/-	37/6	39/-	39/3	38/3	38/-
Benzol, 90%	per gallon	—	-/9¾	-/9	-/9¼	-/9¼	-/9¾
Benzol, 50-90%	„	—	-/10	-/9¼	-/8¼	-/8½	—
Toluol, 90%	„	—	-/10	-/10	-/10	-/10	-/10
Crude naphtha, 30%	„	—	-/4	-/4	-/3⅞	-/3⅞	—
Light oil, 50%	„	—	-/3½	-/3⅝ -/4	-/3½	-/3⅝	—
Solvent naphtha, 90-160	„	—	-/10	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	„	—	-/11	-/11½	-/11⅛	-/11¼	-/11
Creosote in bulk	„	-/2⅝	-/2	-/2	-/2 1/16	-/2 1/16	-/1 7/8
Heavy oils	„	—	-/2½ -/2⅝	-/2¼	-/2⅝	-/2¾	-/2¾
Carbolic Acid, 60's	„	—	1/10½	1/11	1/9	1/9½	1/11
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
„ pressed	„	—	60/-	63/-	60/-	60/- 72/6	—
„ whizzed	„	—	—	—	65/- 72/6	60/- 75/-	60/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1¼	-/1¼	—

A Handsome F'Cap Volume giving a complete account of the

GRANTON GAS-WORKS

OF THE EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS,

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with Illustrations, Plates, and Details of Costs,

BY W. R. HERRING, M.Inst.C.E., &c.

The volume consists of 300 pages, embellished with 228 Photographic and other Illustrations, and 28 large folding Plates. In addition, the Appendices give (in full) the Specifications and Detailed Schedule of Quantities of the Brick and Puddle Gasholder Tank and of the Four-Lift Telescopic Holder at Granton.

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A HISTORY OF THE

INTRODUCTION OF GAS LIGHTING.

BY CHARLES HUNT, M.Inst.C.E.,

Past-President of the Institution of Gas Engineers. Author of "Gas Lighting," which forms the Third Volume of Groves and Thorpe's "Chemical Technology."

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Applications, in candidates' own Handwriting, endorsed "Gas Stoker," stating Age and experience, &c., and accompanied by not more than Two recent Testimonials to be sent to me not later than Aug. 1, 1911.

JNO. JONES,
Clerk.
Town Hall, Portmadoc,
July 11, 1911.

WANTED, a Thoroughly Competent METER REPAIRER, one used to Ordinary Dry and Prepayment Meters.
Apply, stating Age, Experience, and Wages required, to the MANAGER, Derby Gaslight and Coke Company, Friar Gate, DERBY.

WANTED, a General Foreman for Large Gas-Works in the South of England, First-Class Carbonizer. Experience in Machinery preferred. Commence at 55s. per Week and House. Age not to exceed 40.
Applications, by letter, not later than Thursday morning, July 27, accompanied by *copies* of Three recent Testimonials, to No. 5428, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, LEEDS.

THE Corporation of Middleton invite TENDERS for the Supply of about 100 Tons of BOG ORE.
Further Particulars to be obtained from Mr. C. F. Broadhead, Gas Engineer, Middleton.
Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Bog Ore," must be Delivered at my Office not later than Aug. 5, 1911.

FREDERICK ENTWISTLE, Town Clerk.

STRATFORD-ON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 6000 Tons of Good Screened GAS COALS or NUTS for Delivery during Twelve Months ending Sept. 30, 1912.
Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager.
Tenders to be sent in (and will be accepted only on the Form supplied) not later than Aug. 12, 1911.
The lowest or any Tender not necessarily accepted.

J. S. CRANMER,
July 21, 1911. Engineer and Manager.

TENDERS FOR COAL.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for about 250,000 Tons of GAS NUTS and SLACK for delivery during the Eleven Months ending June 30, 1912.
Tenders (Forms of which can be had on Application) must be addressed to Mr. Hanbury Thomas, Managing-Director, and delivered not later than the first post on Tuesday, the 1st day of August next.
The Directors reserve the right to take the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

WM. HAMBY,
Commercial Street, Sheffield. Secretary.
July 13, 1911,

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

THE above Gas Board are prepared to receive TENDERS for the Supply of Screened GAS COAL, to be Delivered at the Gas-Works, Crow Nest, Hebden Bridge, for Twelve Months from the 1st of September, 1911.
The Probable Quantity will be from 6000 to 8000 Tons; but the Gas Board reserve the right to increase or decrease the quantity named.
Further Particulars and Form of Tender to be obtained from Mr. E. J. Wellens, Engineer and Manager, Gas Offices, Carlton Street, Hebden Bridge.
Sealed Tenders, endorsed "Tender for Coal," to be addressed to the Chairman of the Gas Board and Delivered at these offices not later than noon on Monday, Aug. 5, 1911.

RICHARD CRABTREE,
Clerk to the Gas Board.
Gas Offices, Carlton Street,
Hebden Bridge, July 21, 1911.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Friday, the 4th day of August next, at Twelve o'clock (noon) precisely, to Transact the usual Business, including the Declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
HENRY RAYNER, Secretary.
Chief Office: Horseferry Road,
Westminster, S.W., July 18, 1911.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a Half- YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Wednesday, the 2nd of August next, at Twelve o'clock (noon), to Transact the usual Business, including the declaration of a Dividend for the half year ending the 30th of June last.
The Dividends to be declared will be paid to the holders of Preference and Ordinary Stocks registered as Stockholders on the 8th of July, when the TRANSFER BOOKS of the Company were CLOSED.

By order,
WILLIAM MANN,
Office, Brentford, Secretary.
July 17, 1911.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held in the "Livesey Memorial Hall," at the Works of the Company, Lower Sydenham, S.E., on Friday, the 4th day of August, 1911, at 2.30 o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended June 30 last; to declare a Dividend for the same period; and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED from the 21st day of July to the 4th of August, both days inclusive.

By order of the Board,
CHARLES M. OHREN,
Offices and Works, Secretary.
Lower Sydenham, S.E.,
July 17, 1911.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 3rd day of August, 1911, at Six o'clock p.m. precisely, at the "Bell" Hotel, Bromley, Kent, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors: to declare a Dividend; and to Transact generally the Business of a General Meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 19th of July to the 3rd of August, 1911, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.
Offices: 156, High Street,
Bromley, Kent, July 19, 1911.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Gas-Works, Willoughby Lane, Tottenham, on Saturday, the 5th day of August next, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ending June 30, 1911; to declare Dividends; to elect Two Directors and an Auditor for the ensuing Year; and to transact General Business.
The TRANSFER BOOKS for the "A" and "B" CONSOLIDATED STOCKS WILL BE CLOSED from July 29 to Aug. 5, both days inclusive; and the Dividends will be posted on the 11th of August to the holders of Stock registered at the date of the closing.

By order of the Board,
E. TOPLEY,
Secretary.
Chief Offices of the Company,
High Road, Tottenham, N.,
July 19, 1911.

HORLEY DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, Horley, Surrey, on Thursday, the 10th day of August, 1911, at Half past Three o'clock precisely in the Afternoon, to receive the Directors' Report and Statement of Accounts for the Half Year ended 30th of June, 1911; to declare a Dividend for the same period; and to transact the General Business of the Company.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 27th of July inst., to the 18th of August next, both days inclusive.

By order of the Board,
R. SEYMOUR TOBEY,
Secretary.
Gas Offices, Station Road,
Horley, Surrey, July 13, 1911.

HARPENDEN DISTRICT GAS COMPANY.

ISSUE OF £2000 FOUR PER CENT. MORTGAGE DEBENTURES AT PAR.

THE Directors of the Harpenden District Gas Company are prepared to receive APPLICATIONS for £2000 Four Per Cent. MORTGAGE DEBENTURES forming part of £8000 authorized to be borrowed under the powers of the Harpenden District Gas Act, 1901.
The amount now borrowed under the powers of the said Act is £4300; and the present issue of £2000 will make a total of £6300 secured by Mortgage on the undertaking of the Company.
The total issued Share Capital of the Company now amounts to £23,000, divided into two classes of Shares; and recent dividends have been paid at the rates 10½ per Cent. and £7 11s. 6d. per Cent. per Annum respectively on the two classes of Share. The present issue of Debentures is therefore amply secured.
Applications should be made by letter, addressed to the Secretary, before Aug. 5, 1911, and need not be accompanied by a remittance. The Debentures will bear interest from date of payment.

By order,
(Signed) FRED. W. TAYLOR,
Secretary.
Offices: Wheathampstead Road,
Harpenden.